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CUSTOMER-CENTRIC BUSINESS MODEL FOR REMOTE MONITORING SERVICES

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ABSTRACT

Pauli Lakkisto: Customer-centric business model for remote monitoring services
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Development of industrial internet has made it possible for industrial manufacturers to remotely monitor and collect data from their installed base and serve their customers with new and innovative services such as condition-based maintenance. Despite some previous research, there is still uncertainty on the most important customer needs for a remote monitoring service and through what kind of business model should the services be offered. Offering services with inadequate knowledge of the customers' needs has led to ineffective offering and value propositions slowing the spread of these services.

Through a single case study of an industrial manufacturer, this thesis aims to discover what the most important customer needs and business model fundamentals of remote monitoring services are to create understanding for further service growth. The empirical part of this research was conducted as a qualitative case study. The primary data were collected with semi-structured interviews and the secondary data consisted of documents originally from a recent internal development project of the case company. The sources for collected material were both internal interviewees and respondents from customer companies operating in process industries.

The results indicate that the two main customer needs for remote monitoring services in industrial maintenance are increasing the asset output and reducing maintenance costs. Other important needs were found to be getting access to the service provider's expertise, adding predictability to maintenance and achieving safety improvements. It was also found that different needs are closely linked with each other.

A new business model framework for remote monitoring services was proposed. The developed framework was used to structure elements for a successful remote monitoring service business model. Implementing the business model will require new capabilities in understanding customers' businesses, new sales capabilities and technological capabilities in order to develop valuable insights from collected data. The results confirm earlier findings of value propositions and value proving as crucial parts of business models in remote monitoring services.

Collaboration between customers and the service provider was found to be a potential way to create value in remote monitoring services. However, experiences of value co-creation in deeper level are still behind the examples from literature. Remote monitoring services and collaborative value creation were found to be compatible with outcome-oriented earning logics and there was interest towards it on both customer's and supplier's side. To gain more understanding on outcome-oriented earning logics, further research of defining and sharing the achieved benefits, especially in complex multi-actor environments, is proposed.

Keywords: remote monitoring services, business model, customer value, industrial internet, industrial services

TIIVISTELMÄ

Pauli Lakkisto: Asiakaskeskeinen liiketoimintamalli etävalvontapalveluille
Diplomityö, 78 sivua, 4 liitesivua
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Teollisen internetin kehittyminen on mahdollistanut teollisuuden valmistajien keinot etävalvoa laitekantaansa ja kerätä dataa, jonka avulla ne voivat tarjota asiakkailleen uusia ja innovatiivisia palveluita, kuten laitteiden kuntoon perustuvaa huoltoa. Aiemmasta tutkimuksesta huolimatta, on edelleen epäselvää, mitkä ovat etävalvontapalvelun tärkeimmät asiakastarpeet ja minkälaisella liiketoimintamallilla niitä tulisi tarjota. Palveluiden tarjoaminen ilman tarkkaa tietoa asiakastarpeista on johtanut tehottomiin tarjoamiin ja arvolupauksiin, jotka hidastavat etävalvontapalveluiden leviämistä.

Tämän diplomityön tavoitteena on selvittää etävalvontapalveluiden tärkeimmät asiakastarpeet ja niiden liiketoimintamallien perusteet tapaustutkimuksella valmistavan teollisuuden yrityksestä, ja käyttää saavutettua tietoa palveluiden kasvun tueksi. Tutkimuksen empiirinen osuus toteutettiin laadullisena tapaustutkimuksena. Ensisijainen aineisto kerättiin puolistrukturoiduilla haastatteluilla ja toissijainen data koostui dokumenteista, jotka oli alun perin luotu osana kohdeyrityksen sisäistä kehitysprojektia. Aineiston lähteinä käytettiin sekä kohdeyrityksen henkilöstöä että vastaajia prosessiteollisuuden asiakasyrityksistä.

Tulokset osoittavat, että teollisuuden kunnossapidon etävalvontapalveluiden kaksi tärkeintä asiakastarvetta ovat tuotantolaitteiden tuotannon lisääminen ja kunnossapitokustannusten alentaminen. Muita tärkeitä tarpeita ovat pääsy systeemitoimittajan asiantuntemukseen, kunnossapidon ennustettavuuden lisääminen ja parannukset turvallisuudessa. Lisäksi havaittiin, että erilaiset asiakastarpeet liittyvät läheisesti toisiinsa.

Tutkimuksen tuloksena esitettiin uusi viitekehys etävalvontapalvelujen liiketoimintamalleille. Kehitettyä viitekehystä käytettiin hyvän etävalvontapalvelun liiketoimintallin elementtien esittämiseen. Liiketoimintamallin toteuttaminen edellyttää uusia kyvykkyyksiä, kuten asiakkaan liiketoiminnan parempaa ymmärtämistä, uudenlaisen myyntiosaamisen hankkimista ja teknologista osaamista, jotta yritys pystyisi jalostamaan datasta arvokasta tietoa. Tulokset vahvistavat aiemmat löydökset arvolupauksesta ja arvon todentamisesta etävalvontapalveluiden liiketoimintamallin erittäin keskeisinä osina.

Yhteistyö asiakkaan ja palvelun toimittajan välillä havaittiin potentiaalisena tapana luoda arvoa etävalvontapalveluissa. Esimerkit yhteisestä arvonluonnista syvemmällä tasolla olivat kuitenkin jäljessä kirjallisuudessa esitettyjä malleja. Etävalvontapalvelut ja yhteinen arvonluonti havaittiin yhteensopiviksi hyötyperusteisten ansaintalogiikoiden kanssa. Sekä kohdeyrityksessä että asiakasyrityksissä oli kiinnostusta hyötyperusteisia ansaintalogiikoita kohtaan. Hyötyperusteisten ansaintalogiikoiden ymmärryksen lisäämiseksi ehdotetaan jatkotutkimuksia saavutetun arvon määrittämisestä ja jakamisesta, erityisesti monimutkaisissa usean toimijan toimintaympäristöissä.

Avainsanat: etävalvonta palvelut, liiketoimintamalli, asiakasarvo, teollinen internet, teolliset palvelut

PREFACE

This has indeed been a long journey, but finally it seems to have come to an end as this thesis is complete. Foremost, this has been a learning process of both the subject as well as managing the project and myself. Now it is a good time to give acknowledgement to those who helped me during this project.

A big thanks goes to the examiners Miia and Beheshte, without your excellent advices this thesis would not be even close to what it is now. I want to also thank people from the case company, especially my supervisor Juha for giving me this opportunity.

Support and trust from my family has been constant, even when I myself was not sure how to proceed. The almost daily lunch companion and peer support from Jenni provided good chances to discuss our thesis' problems. Last but not least, I want to thank Katariina for supporting me throughout the project and helping me to focus also on other things than this project.

Tampere, 31 March 2020

Pauli Lakkisto

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LIST OF ABBREVIATIONS

B2B	Business to business
BMC	Business model canvas
CDL	Customer-dominant logic
GDL	Goods-dominant logic
IoT	Internet of Things
NFC	Near field communication
OEM	Original equipment manufacturer
PLC	Power line communication
PSS	Product-service system
RFID	Radio frequency identification
RM	Remote monitoring
RQ	Research question
SDL	Service-dominant logic
TCO	Total cost of ownership
TVO	Total value of ownership

1. INTRODUCTION

1.1 Background

Role of services in industrial business has been emerging for a long time and many studies on industrial services have already been published. Companies have shifted from just selling physical products to providing different services in the process of servitisation. Oliva and Kallenberg (2003) pointed out that either of services or products tend to be considered as “add-ons” to support the more important one. Adding services has traditionally been a way to support product sales, to gain an advantage over competitors and to avoid commoditisation of the products. (Reinartz and Ulaga 2008). The “add-on approach” has traditionally meant product-centred business models for manufacturers. The concept of product-service systems presents services and products as an integrated system where both have equal importance (Meier et al. 2010).

Quite recently, the service offerings have evolved with the help of technological development and digitalisation as companies have become able to collect, save and analyse vast amounts data and information from their installed base. The data collected by monitoring the installed base of manufacturers has allowed companies to learn from their customers’ operations and how customers use their equipment. The installed base data has also made way for new and more advanced digital services. These services may include rather basic remote condition monitoring and data collection, but the services can also extend to preventive scheduled maintenance and optimising the usage of the equipment. In this thesis, such services are later referred as remote monitoring services (RM services). That, among other important concepts will be further defined in chapter 2 of this thesis. The digitalisation of servitisation is commonly seen as a phenomenon that changes competition in service markets (Porter and Heppelmann 2014). New digital possibilities such as ever-present computing enable companies to deliver more value to customers than before (Jonsson et al. 2008) causing adopting these technologies to become a necessity for manufacturers in order to stay competitive (Momeni and Martinsuo 2018). However, to succeed with digital services, changes to business models are required (Luz Martín-Peña et al. 2018).

Some aspects around remote monitoring services remain quite unknown. According to Grubic (2018) role of remote monitoring in servitisation is still under-researched considering its importance for servitisation, even though servitisation has been in the focus of discussion for some time. Remote monitoring offerings are still in early phase and all possible service opportunities have not been recognised, let alone implemented (Klein et al. 2018). The immaturity of the industry makes it more difficult to fully understand possible solutions and needs and thus many models on business models and their development are still theoretical (Reim et al. 2015; Leminen et al. 2018). Collaboration and

value co-creation are among topics of interest for many scholars (Kohtamäki et al. 2019). Yet the extent of remote monitoring services as a collaboration project is unclear (Grubic 2014). How much of their processes are industrial companies willing to operate themselves and how much they are ready to externalise? Or is it possible that companies wish to participate collaboratively to service development and possibly even operation?

Remote monitoring services are fairly new additions for many companies, the market is evolving rapidly and so are the customer needs and wishes (Paananen and Seppänen 2013). Boksberger and Melsen (2011) highlighted the importance of research on what measures of perceived value are the most important ones in service industry. In addition to limited experiences on remote monitoring services, many manufacturers struggle to articulate their value propositions on remote monitoring in an appealing way (Grubic 2014) and to prove the delivered value to customers (Grubic 2018).

The main themes in this thesis are remote monitoring services, business models and customer value. This thesis aims to research what the most important customer needs and sources of customer value are for remote monitoring services. The thesis also aims to find out how business models could be developed to be more suited to offer remote monitoring services.

1.2 Research context

This study is conducted in collaboration with a company, later “the case company”. The case company is a large multinational industrial corporation that operates in the area of automation and electrical equipment. It operates around the globe and has a wide product and service portfolio ranging from software to heavy machinery. This thesis focuses on the part of organisation that offers service solutions to customers in process industries. Solutions include basic services with long traditions as well as newer and more advanced services such as remote condition monitoring of customers’ plants. As all customers are companies, this thesis takes a business to business (B2B) point-of-view to the theme.

Although the case company has a strong background as original equipment manufacturer (OEM), the target team in the case company does not manufacture any physical products. The target team is therefore a pure service organisation combining its expertise in services to the expertise of product business units, thus making inter-organisational collaboration a key capability. Due to the team being solely a service organisation, this thesis focuses exclusively on services and service business.

Despite a growing interest in service business, more than 80% of the case company’s total revenues still came from sales of products in 2018, leaving the share of service sales slightly under 20%. This fact emphasises the need and possibilities of development to service business in the case company.

This thesis takes a customer point-of-view to research business models in remote monitoring services for industrial business. In the development of the case company's business model, the focus will be on value proposition and value capturing. Thesis includes research on key customer needs and the sources of customer value in order to determine the best concept and value proposition for the services. The goal is to find out which contents are most valuable to customer and what kind of services are they willing to pay for. Thesis will also explore which methods of value capturing would be suitable for customers and attractive for the case company.

1.3 Research problem and research questions

Research problems are the uncertainty on what the customers' needs and expectations are, as well as the sources of customer value in the context of remote monitoring services industrial business. Some technical solutions exist for collecting information, but it is still unclear on how that information should be utilised and what type of services should be offered to create value for customers. Thus, the fact that customer needs have not yet been recognised completely results in inadequate information on what the customers want and are willing to pay for. Due to the lack of information on the needed services there is also no certainty on the type of business model that would be the best for carrying out remote monitoring services.

Main objectives of the thesis are to clarify the key needs of the customer and develop the business model towards a more customer-centric way to fit those needs. Furthermore, the thesis aims to create understanding on value capturing mechanisms in remote monitoring services and to possibly find alternative earning logics to help companies achieve business value from their service contracts. With the mentioned research problems, research questions (RQ) can be formed:

RQ1: What are the key customer needs for a remote monitoring service?
RQ2: Through what kind of business model can the firm offer remote monitoring services that fulfil the needs of the customer?

With the aim of answering the aforementioned research questions, the thesis strives to create theoretical knowledge on how remote monitoring services should be used to create value in industrial context. Furthermore, the thesis aims to provide valuable information on how the case company should develop its business in order to better succeed in its industrial service business.

As value proposition and earning logic are at the centre of the thesis' business model development, the delivery of the service is not such a high interest: processes of the service operations are not investigated that thoroughly, but they are acknowledged. Research on value delivery will mostly focus on the needed resources and capabilities. Industry wise, the scope is limited to different process industries companies as the current and most of the potential customers of the case company operate in that industry.

As emergence of digital services are a continuum to servitisation, servitisation will be covered briefly in literature review. Yet the focus of the thesis is not in spread of services or digital services itself, as that field already has a lot of studies conducted, but rather in how companies can gain value in this changing environment.

1.4 Structure of the thesis

This thesis consists of six chapters and is organised as follows. After this introduction, main theory related to the topic will be analysed in a literature review in chapter two. The literature review presents first the basic background theory and then proceeds to articles concerning previous examples and analyses of business models in remote monitoring services. The literature review aims to build a strong theoretical ground and presents a conceptual framework of business model elements in remote monitoring services to support the empirical part. Chapter three presents the methodological choices made in this thesis. This thesis is as an explorative single case study. Data used in this study consisted of primary data from interviews and secondary data from documents from the case company, both of which were qualitative. Chapter three also includes a further description of the case company's service business and the customer companies, as well as how data was collected and analysed.

The results from the empirical part are presented in the fourth chapter. Results regarding the state of remote monitoring services in the case company are presented first followed by results regarding value creation, delivery and capture of the case company's remote monitoring services. Results of the empirical part and findings from the second chapter are later compared and analysed in chapter five, discussion. The customer needs identified from the data are compared to the findings from the literature. Moreover, findings regarding the business model of the case company are combined with the framework presented in the literature review to create an understanding of different elements of a business model suitable for remote monitoring services. Finally, the most important findings and contributions along with limitations and possible topics for future research are presented in chapter 6, conclusions. Conclusions also include a list of proposed improvements for the case company.

2. THEORETICAL BACKGROUND

2.1 Key concepts and definitions

2.1.1 Remote monitoring services and business models

There are multiple different terms describing related to digitalisation of services. Some of the terms have very similar meanings although there are also differences. The language used in literature has also changed along with the development of technology. Remote monitoring services are connected by innovations in both technology and business models. Most important terms related to the topic of the thesis are defined briefly in this chapter and later discussed more thoroughly. Technological concepts include such as internet of things and industrial internet whereas business concepts related to concept cover e.g. business model and customer value. These phenomena form the basis for remote monitoring services and other advanced services.

***Industrial services**,* by definition, are services to fill the needs of industrial customers. Industrial services can be defined with different viewpoints such as processes of supporting customers industrial production, offering after sales services to assets sold by manufacturers, or following the IHIP principles (intangibility, heterogeneity, inseparability and perishability) of services (Schmitz et al. 2015). Industrial services may vary a lot and cover a wide range of industries and applications. Industrial services and their development will be covered more in depth in chapter 2.1.2.

Industrial internet is a concept that means applying internet of things (IoT) in the environment of industrial manufacturing (Martinsuo and Kärri 2017), whereas internet of things can be seen as an umbrella term to cover all of expansion of internet and connectivity into physical equipment and devices, supporting technologies and applications (Miorandi et al. 2012). Internet of things covers broad selection of equipment and applications where intelligence, connectivity and communications are added to products. The topic will later be discussed more specifically in chapter 2.1.3.

Remote monitoring (RM) can be defined as collecting real-time data from an asset and using it to measure and determine the condition of that asset (Grubic and Peppard 2015). Data collection is made possible by an incorporation of hardware and software (Grubic 2014). Hardware often includes sensors attached to industrial equipment such as motors and pumps whereas common software includes cloud technology and algorithms. Remote monitoring will be defined more thoroughly in chapter 2.2.1.

Remote monitoring services are in turn services that use remote monitoring to produce value to customers. These customers are mostly industrial B2B organisations. A general benefit of RM services is the increased productivity provided by avoiding downtime (Jonsson et al. 2008). This can be achieved reactively by more efficient troubleshooting

and fault detection thus shortening times unavailability. Other way is by analysing the collected data and providing predictive maintenance to completely avoid breakdowns. Remote monitoring and RM services will be considered more in depth in chapter 2.2.1.

Customer value is understood in this thesis as a customer's trade-off between total benefits versus total sacrifices (Woodruff 1997). Total customer value is uniquely perceived by customers and formed from different components both monetary and non-monetary (Kotler and Keller 2006). Though value is always perceived by the customer, it may be created by collaboratively by both supplier and customer (Grönroos 2011). These issues will be discussed more thoroughly in chapter 2.3.1.

Business model can be defined as a tool that expresses the business logic of a company (Osterwalder et al. 2005). Key contents of a business model are divided into three processes: value proposition, value delivery and value capture (Chesbrough and Rosenbloom 2002). Business model describes how a company has designed these three processes to support its business (Teece 2010). Business model will be further explained in chapter 2.3.2. Main terminology of this thesis and how they are interlinked are presented below in figure 1.

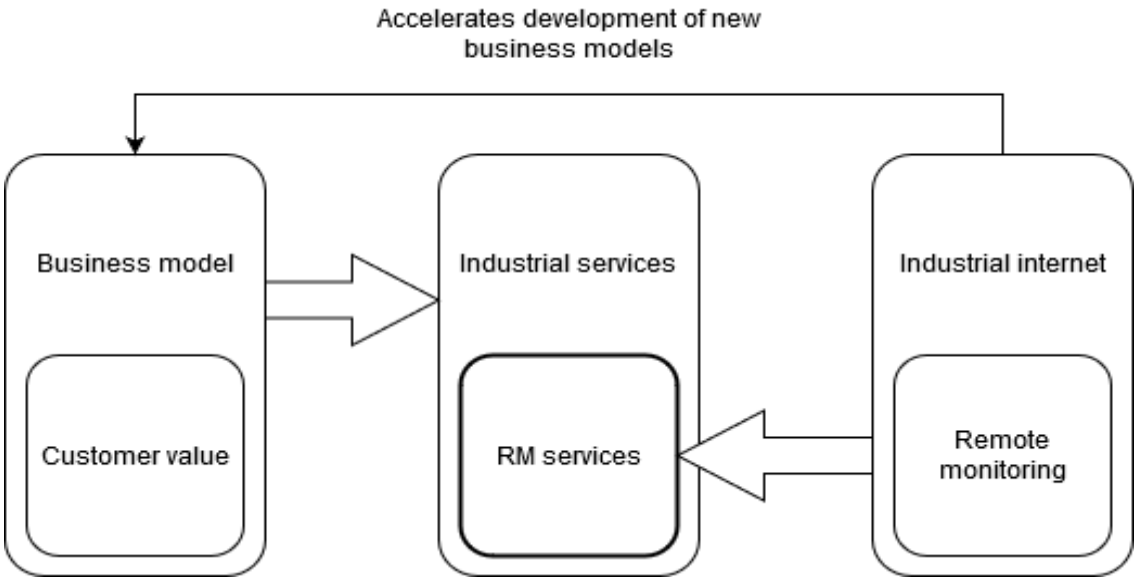

Figure 1. *The key concepts of the thesis and the links between them*

As can be seen from the figure, remote monitoring services are in the centre of this thesis. Some of the concepts are interlinked and some are subordinate to others. Remote monitoring services are part of larger entity of industrial services. Similarly, customer value is a concept in business model and remote monitoring is a concept within industrial internet. Offering any sort of industrial services requires a service provider to have a business model that explains the logic according to which value is created, delivered and captured. Industrial internet is considered as a technical factor. Remote monitoring is a prerequisite for offering remote monitoring services. Moreover, development of industrial

internet is seen as a change driver that accelerates the development of new innovative business models.

2.1.2 Servitisation

Role of services has been recognised for a long time and is not a novelty in literature. One of the earliest was Levitt (1972) who expressed that all business is service business with varying importance highlighting that all industries include interaction between people in sales, customer service and after-sales for example. Attention to industrial services increased as the term servitisation was first introduced in 1980's by Vandermerwe and Rada (1988) who defined it as creating value by adding services to products. Later, servitisation has been defined as the innovation of organisation's capabilities and processes to create mutual value through a shift from selling products to product-service-systems (Baines et al. 2008; Neely 2009). Servitisation has since become a frequently studied subject as manufacturers have increased the proportion of services in their business (Gebauer et al. 2016).

There are a few different perspectives to servitisation and industrial services. Oliva and Kallenberg (2003) introduced the idea of spectrum where either of products or services are the main offering of the company and the other functions as an "add-on" to support the more important offering. The spectrum depicts the shift as gradual, step-by-step. Yet it has the idea of a products and services being parts of different offerings that despite of supporting each other, are also competing against one another e.g. in case of buying new versus maintaining old equipment. Another issue related gradually adding services to complement products is that it often does not allow services to get all the attention they need to be successful. Brax (2005) found out that adding services slowly next to physical products causes them to be neglected as the main focus still remains in physical products. Results imply that to achieve full potential of services the organisation needs to make more radical changes to organisation so that services are not left as add-ons. On the other hand, findings also suggest that services and products are both supporting each other's sales (Visnjic Kastalli and Van Looy 2013).

A more comprehensive view on successfully combining industrial products and services is presented in the idea of product-service system (PSS). Product-service system can be defined as an "integrated product and service offering that delivers value in use" (Neely 2009) or as "integration of products and services to fulfil customers' needs by enabling new business models" (Meier et al. 2010). Their definitions describe PSSs as packages where both products and services are offered at the same time, and where neither is left as an add-on and both feature as parallel contents of offering.

However, an article by Tukker (2004) challenges the view of products and services being equally important in PSSs. The article classified PSSs into three different main categories (product-, use- and result oriented) and in total eight different subcategories. Similar to Oliva and Kallenberg's (2003) ideas of services or products as an "add-on", Tukker (2004) sees that some PSS models have services with a very limited role whereas for

some models it is the other way around. However, it is arguable whether these models would be really considered true PSSs according to other definitions.

Nevertheless, based on these definitions it can be deduced that in a Product-service system a package consisting of both products and services together is offered to create value to customer and the supplier. The balance between services and products may vary, but to be considered as a PSS both components should have relevant role in the value creation.

Manufacturers have had to make changes to their business logics as services have become increasingly important for them. Service-dominant logic (SDL) was introduced by Vargo and Lusch (2008) to point out the difference to traditional goods-dominant logic (GDL) when shifting from goods to services. SDL sees services as the main focus point of business contrary to products in GDL. Services are seen as a process, instead of an outcome or transaction, where supplier does something for the customer without the need for exchange of any goods (Vargo and Lusch 2008). SDL highlights relationship and collaboration and breaks the division into producer and consumer. SDL sees that supplier and customer both provide their own resources and thus participate together even though one party still has the role of customer. In SDL, both the supplier and customer participate in the service process and thus co-create value.

Service-dominant logic however does not look beyond the service relationship. Heinonen et al. (2010) challenge and develop the idea of SDL by classifying both GDL and SDL as supplier-dominant logics. Customer-dominant logic (CDL) is proposed to better help companies understand the customer's perspective in service business. Unlike GDL and SDL, customer-dominant logic sees the service provider taking part in customers' activities and not vice versa. Customers do not buy and use services in a vacuum, and it is important that CDL also pays attention to activities before after the act of service to better understand the service context. CDL sees value being created in use of customer, who controls which supplier may participate in it and provide for the customer.

2.1.3 Effects of industrial internet on service business

Intelligence built into devices can be seen as a key driver to business and competition (Porter and Heppelmann 2014). This applies to services as well. A key enabler for the development of remote monitoring and advanced service offerings has been technological development as sensors and other smart products have created on opportunity for new service business. Ubiquitous computing, autonomy, machine-to-machine communication are listed as currently available features associated to IoT (Atzori et al. 2017). Porter and Heppelmann (2014) point out that speciality of IoT does not lie in "internet" as it is just a technique for communication, but in "things" that for the first time new capabilities for communication, data gathering and even analysis.

However, a comprehensive technology infrastructure, including product cloud, integration between different systems, knowledge management capabilities and measures on cyber security, is required in order to achieve the benefits of the new features (Momeni

and Martinsuo 2018; Porter and Heppelmann 2014). The increasing intelligence embedded in products is expected to steer companies business models towards those of the software industry, making manufacturers software companies to some extent (Porter and Heppelmann 2015). Expected changes include such as increased attention on customer success and shifting focus from products to systems and selling them as a service. Omnipresent computing enabled by industrial internet is also found out to be a factor that creates new service business opportunities. These view sees industrial internet as an enabler of servitisation in industrial companies.

In addition to accelerating servitisation, industrial internet applications are also seen to increase complexity in business models (Dijkman et al. 2015). A big factor in the growing complexity is mentioned to be the increased use of network partners and their resources. IoT is seen to bring ecosystem thinking to business model development (Leminen et al. 2018). In this thesis, ecosystem is understood as a large group of interconnected actors, both competitors and collaborators, who depend on each other for their effectiveness and survival (Wulf and Butel 2017). It is a concept that emphasises value creation and capture between interrelated companies (Kohtamäki et al. 2019). Typically, ecosystems have a hub company surrounded by other companies (Kohtamäki et al. 2019). A local example of this is a harbour run by a hub company surrounded by other companies offering services and products related to that field. A more global example is a technological ecosystem of Apple or Google as the hub company with several software and hardware companies operating in the ecosystem.

Due to changes in key capabilities, traditional partners such as resellers may not be sufficient for IoT services and may need trained further or upgraded to ones with more fitting capabilities to fulfil the new needs (Hakanen et al. 2017). While growing part of the value creation is tied to collaboration with network partners, the capability to build and maintain relationships to network companies essential in order to get access to their resources and for achieving success over the long-term (Grubic 2014).

2.2 Attributes of remote monitoring services

2.2.1 Remote monitoring services

Industrial services with advanced features have seen increasing interest by companies and scholars alike, yet terminology around it is still fragmented as same concept is referred with many words in literature (Grubic 2014). A literature review by Grubic (2014) found out that used terms vary from earlier, teleservices to more recent remote diagnostics, remote monitoring, smart services. Grubic (2014) uses the term remote monitoring technology and defines it as an incorporation of software and hardware which enables data collection from a certain product. Grubic and Peppard (2015) state that remote monitoring technology aims to collect real-time data to define the condition of an asset and use to information to optimise its availability and performance. Different terms seem very much alike with common emphasis on remoteness, monitoring and using gathered information to analysis such as diagnostics. This thesis uses the term “remote monitoring

services" (RM Services), defined as services that use remote monitoring technologies to produce value to customers.

Remote monitoring services are illustrated as a combination of outcomes of servitisation and digitalisation below in figure 2. Two key phenomena affecting RM services are technological development of digitalisation and servitisation of organisations (Kohtamäki et al. 2019). Organisationally, RM services benefit if the organisation is overall service-oriented and are halted if organisation is not servitised enough. It is however worth noting, that having RM services along with traditional services accelerates servitisation in the company compared to having only traditional services (Grubic and Peppard 2015). Interaction between RM services and servitisation therefore appears to be two-sided. Technological development enabled by digitalisation is another key driver of RM services (Grubic 2018). However having technology alone is not sufficient to create business value (Momeni and Martinsuo 2018; Oliva and Kallenberg 2003).

Technological components of RM services include smart and traditional hardware, software and connectivity components (Porter and Heppelmann 2014). Smart components of remote monitoring services are components that are used to e.g. collect data, store data, provide user-interface to users and replace traditional physical parts. Connectivity components refer to parts that are used to connect the product to users and other products. These components include e.g. ports and antennae. Communication, especially machine-to-machine communication is needed to transmit the data from devices that collect it to the system. Examples of communication technologies used in RM services are bluetooth, power line communication (PLC). Radio frequency identification (RFID) and near field communication (NFC) (Bello et al. 2017). These smart and connectivity components are complemented by physical components. These components together make processes of RM services such as data acquisition and analysis possible.

Offering RM services is however not only a technological but also organisational challenge. In many cases, managerial challenge seems to be the more difficult one for companies (Grubic and Peppard 2015). RM services require organisational support and that a service business model has been developed. The support for services must be from multiple levels of organisation including top management (Allmendinger and Lombreglia 2005) sales and marketing (Brax 2005), and service technicians (Kuschel and Ljungberg 2005). Barriers and requirements for RM services will be further discussed in chapter 2.3.2.

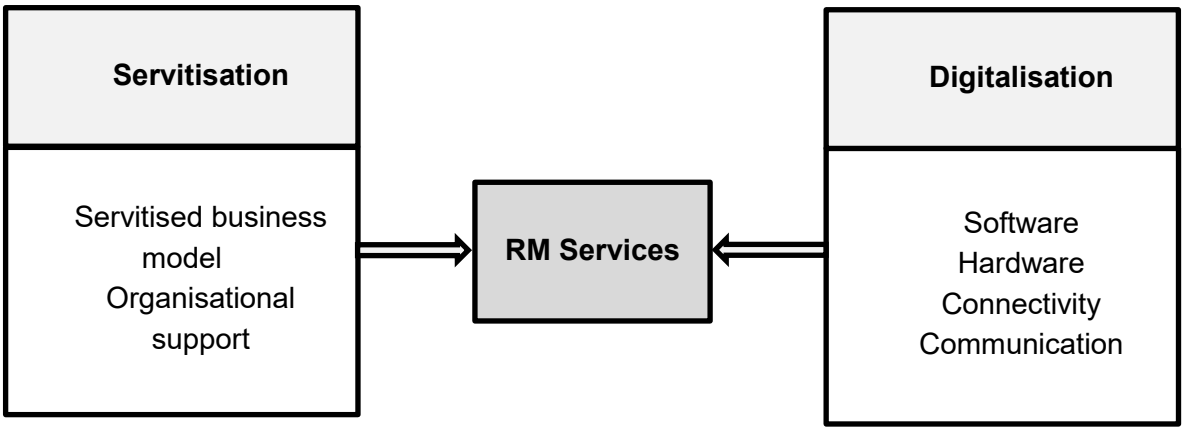

Figure 2. *Remote monitoring services as outcome of servitisation and digitalisation*

2.2.2 Benefits of remote monitoring services

Remote monitoring services can be beneficial in several ways. In this study, benefits are explored in from the perspectives of both the customer and the supplier respectively. According to Frank et al. (2019) value for new technological capabilities adds value to manufacturers processes and increased focus on services brings value for customer through increased attention on demand side. Based on literature, several benefits for the providing company were identified. After analysing the findings, different types of benefits of RM services to the service provider were classified into four different categories: internal development, creating new business from data, cost savings and image benefits. These are presented in figure 3 below.

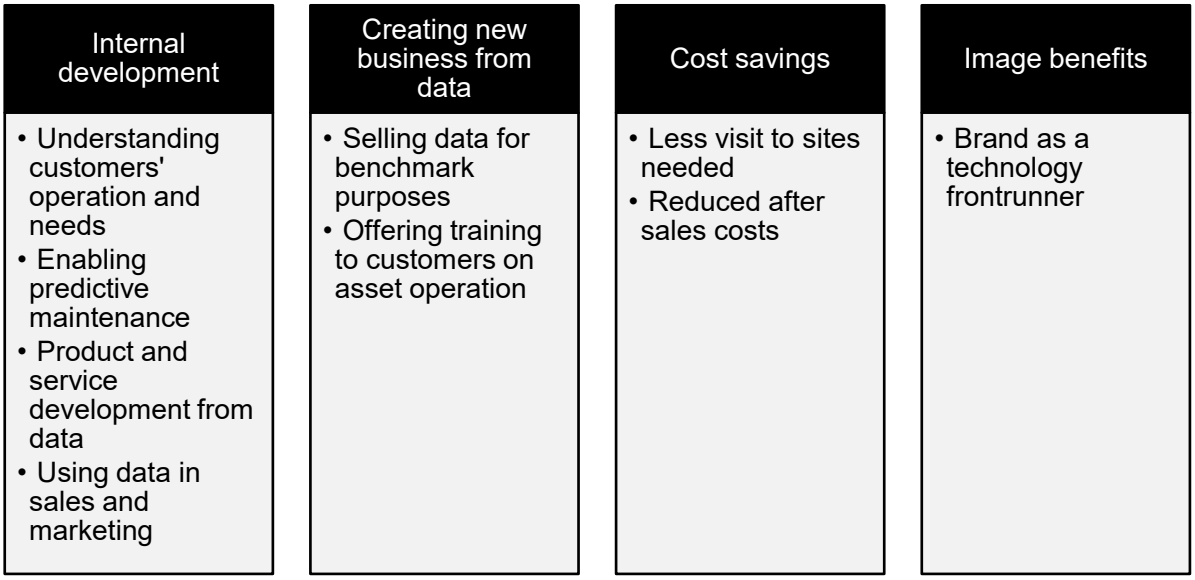

Figure 3. *Benefits of the supplier*

Internal development refers to ways the service provider can create knowledge and develop itself based on its experiences from RM services. This includes better understanding of customers' needs and the way they operate their business (Grubic 2014; Momeni and Martinsuo 2018). Acquired knowledge can be also used to improve maintenance to be more predictive. By collecting and analysing data service provider can learn to better understand the patterns suggesting that there is a need for active maintenance (Grubic 2014). Data from how products are used, and information on typical failures can be used by companies to further develop products and services and to customise those for each customer (Momeni and Martinsuo 2018). Collected data can also be used in sales and marketing to better understand profitability and characteristics of different businesses and markets (Momeni and Martinsuo 2018).

Firms can also create new types of business from the data, in addition to selling products and offering traditional maintenance. Collecting vast amounts of data increases knowledge on what level of performance different customers have achieved. Data can be sold to customers for benchmarking purposes or used for training the customers to operate their assets more efficiently (Momeni and Martinsuo 2018). It is also common to achieve cost-efficiencies from RM services (Momeni and Martinsuo 2018; Grubic 2014; Löfberg and Åkesson 2018). If faults can be correctly diagnosed remotely, less on-site visits are required identifying and resolving faults. Preventive maintenance also makes it possible for service providers to plan their operations in more advance and thus manage their service organisations better (Jonsson et al. 2008). More efficient service operations allow the firm to operate with lower costs leading to lower prices or improved margins. Moreover, being a supplier of advanced services creates an image of a technology frontrunner and improves the brand of the firm (Löfberg and Åkesson 2018).

From customer's perspective, different benefits were grouped to three categories. Most important benefits from RM services are usually related to enhanced operational efficiency (Grubic 2014; Jonsson et al. 2008; Löfberg and Åkesson 2018). Scheduled maintenance makes the operational environment more stable and predictable by increasing machine uptime and preventing breakdowns. That in turn helps to avoid lost production. Transferring risks to the supplier is another way to increase stability in the customer company (Grubic 2014). Risks managed by purchasing services from RM service provider can include such as risk of non-availability suboptimal performance, quality, losing key personnel to rival companies and health safety risks (Grubic and Peppard 2015; Grubic 2014; Grubic 2018). Transferring risk to service provider allow companies to achieve a more predictable operational environment. Risk transferring is linked to contract type and value proposition made by the supplier that may be e.g. outcome-based. Image benefits from using state-of-art methods are also possible by using RM services (Löfberg and Åkesson 2018). Main benefits of RM services to customer are presented below in figure 4.

Figure 4. *Benefits to customer*

It is however notable, that even though benefits for customer and supplier are presented separately here, they are linked to some extent. For example, lower costs of service make it possible for service providers to lower their prices hence creating value for the customer. Furthermore, it could be argued, that creating benefits to customer is valuable for supplier per se, as it makes the supplier a more attractive business partner. Some of the mentioned benefits also overlap partly. For instance, internal development and organisational learning are required in order to be able to train customers on asset operation. Also, the difference between using data for organisational learning and creating new business may be ambiguous in some cases.

2.2.3 Barriers and requirements of remote monitoring services

In addition to benefits, the literature also features some factors that are preventing RM services and requirements whose absence will limit their development. In this study, barriers and requirements are divided into organisational and functional factors. Organisational factors are related to management, resources, capabilities and attitudes inside the providing company and customer. Functional factors cover challenges in technology and connectivity.

Klein et al. (2018) found several barriers to RM services that they integrated into four classes: (1) internal resources and capabilities, (2) customer relations and information, (3) value proposition and customer needs, (4) adaptability. First category includes corporate culture not being service-centric enough, unsuitable organisational structure, unclear service strategy and lack of top management support among other things. The second class includes factors such as data ownership and trust issues with customer. The possible ethical issues and customers' scepticism related to manufacturers monitoring the usage of the products is also highlighted by Grubic (2014). Generally, there are examples of methods to improve data security such as customers controlling when and what data is transmitted (Porter and Heppelmann 2015). As quite a few tools for better data security already exist, the problems regarding data security seem to be more about trust and creating a good relationship between the supplier and the customer rather than lack of technical solutions (Löfberg and Åkesson 2018). Third group consists of insufficient knowledge of customers' needs and expectations causing ineffective communication of value and unclear value propositions. The fourth category deals with inability to

identify business opportunities and seize them in addition to failure in adapting to circumstances and offering solutions that match customer expectations. Of these groups all were statistically significant according to the research, but the third group dealing with value propositions came out as the most significant.

Most of the issues found by Klein et al. (2018) are related to managing the service instead of technical functions of the service. Their research resembles with earlier results claiming that having a successful RM services is more of a managerial challenge than it is a technical one (Allmendinger and Lombreglia 2005). Despite listing a total of over 20 factors, Klein et al. (2018) did not find factors related to actual delivery of services. For instance Grubic (2014) found out that the gap between the monitoring team and the onsite team is a typical challenge in remote monitoring.

In addition to managerial barriers, some barriers related to functional and technical side exist as well. Lack of standardisation causes incompatibility issues (Grubic 2014). This fits the idea of IoT being likely to produce closed ecosystems when technology is in relatively early stage (Leminen et al. 2018). Jonsson et al. (2008) recognised that RM technology is only able to detect those faults or failures for which it was designed to. If an algorithm is designed to create a notification when temperature of an asset is too high it will measure the temperature, but not e.g. pressure levels if it is not instructed to do so. RM services need knowledge management to support technological capabilities and understand picture beyond collected data (Grubic and Peppard 2015). Momeni and Martinsuo (2018) noted that an IoT ecosystem with common standards, platforms and interfaces is required in order to achieve significant growth from IoT business. Porter and Heppelmann (2014) described this infrastructure as a “technology stack”, that consists of the products, communication networks and cloud, where data is stored and analysed. The infrastructure should also be integrated into company’s other systems such as ERP. Grubic (2014) adds that although potential of RM services is great and the list of possible benefits is long, it is still unclear how to achieve some of these in practise.

2.3 Customer value and business model

2.3.1 Customer value

The concept of business model deals a lot with the concept of value. Like business model, value too has created a lot of research and different definitions depending on perspective and has not been defined unanimously, even though there are some perspectives more popular than others (Paananen and Seppänen 2013). This thesis takes the point of view of customer value as a trade-off between total benefits versus total sacrifices. This perspective has been widely presented and accepted among scholars (Woodruff 1997; Payne and Holt 2001; Chesbrough and Rosenbloom 2002; Boksberger and Melsen 2011).

Even though customer value is considered as a trade-off, its nature is not just transactional, but much broader, including the relationship as well (Payne and Holt 2001). Both

total benefits and sacrifices (also referred as costs) are formed of several factors, monetary and non-monetary (Boksberger and Melsen 2011). Kotler and Keller (2006) classified possible benefits into product value, services value, personnel value and image value and costs into monetary, time, energy and psychic costs. These costs and benefit are not related to just the usage of the product or service but the whole life cycle, including also searching for the product, acquiring it and disposing it after the usage. Different components of customer value are presented below in figure 5.

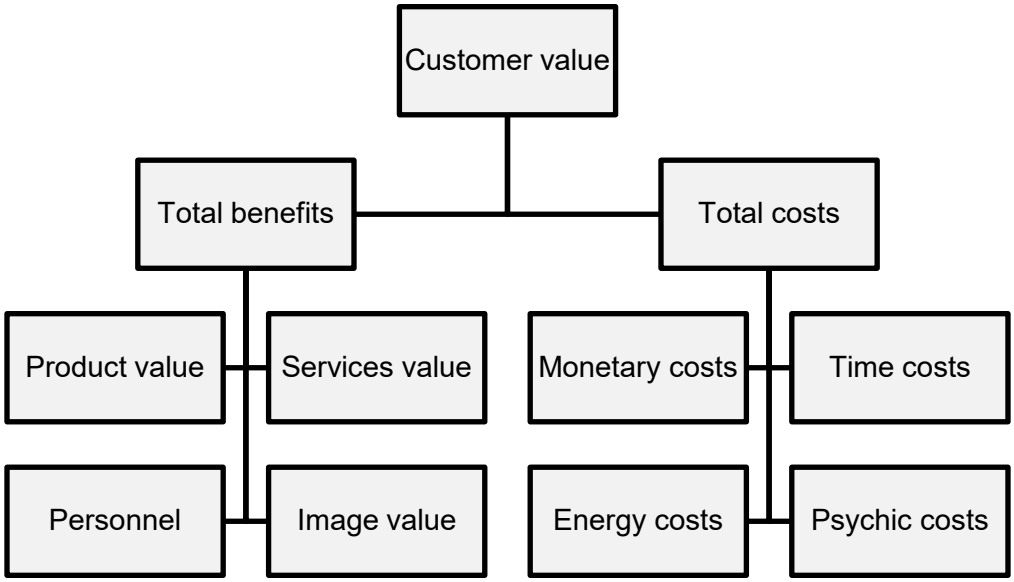

Figure 5. *Components of customer value, adopted from Kotler and Keller (2006)*

Similar ideas have been presented by other authors as well. Literature review by Boksberger and Melsen (2011) broadened those definitions by listing time, effort, convenience and psychic factors as the main non-monetary costs. Total cost of ownership (TCO) is concept that deals with different monetary costs occurring to customer. It takes into account different cost such procuring, acquiring and using offerings and is thus more descriptive than just the selling price of a product or service (Wouters et al. 2005). Wouters, Anderson and Wynstra (2005) add TCO needs a consideration of all the benefits as well to arrive into total value of ownership (TVO) that is the equivalent of earlier mentioned customer value, total benefits versus total sacrifices.

In addition to being formed of different elements, value is also dependent on who is the customer. Paananen and Seppänen (2013) noticed that value is always perceived by customer, thus making it difficult to interpret. Chesbrough and Rosenbloom (2002) stated that value is whatever customer will pay for the product or service. Kotler and Keller (2006) argued that customers are value maximisers: they estimate total value of each option and choose the one they think has the highest value. This thesis also takes the point-of-view that value is perceived by the customer.

The fact that value can be different to each customer makes it increasingly important for companies to know what each customer considers valuable (Woodruff 1997). As value is perceived and formed of both monetary and non-monetary components, total value perceived by customer may be negative even if the service provider considers it monetarily profitable to the customer. Paananen and Seppänen (2013) added that in businesses with a fast clock-speed also the customer needs tend to evolve more rapidly. In the context of this study, the rapid technological development considering remote monitoring and increased capabilities to collect and analyse big amounts of data hints can be seen as factors that accelerate change in customers' needs. This challenges the companies to be even better in knowing their customers in order to be successful.

Customer value is communicated via value proposition. Value proposition includes all the components of the offered value and explains how they are packaged in order fulfil customer's needs (Osterwalder and Pigneur 2003). Value proposition is sometimes short-sightedly used as an advertisement tool (Anderson et al. 2006), when it should be a way to prove the offered value to selected customer. Anderson, et al. (2006) state that value proposition should focus on only few selected points that matter the most to customer and explicitly show why the supplier would be better option than its competitors. Including also redundant features is seen to only confuse customer. Keeping a value propositions concise is a common challenge for companies (Anderson et al. 2006). Porter and Heppelmann (2015) noticed that value propositions expand as offerings become more complex and products become parts of larger systems. It can be stated that the challenge of avoiding scattered value propositions is especially relevant to bigger companies with bigger offerings.

Oliva and Kallenberg (2003) highlighted that technology or product such as condition monitoring per se does not add value to the end-user, but value is achieved when technology is used gain benefits, such as increased availability (Oliva and Kallenberg 2003). Grubic and Peppard (2015) agreed that technology itself has no value, but added that it has value potential which is converted to actual value when technology is used. This idea is called value-in-use. Value-in-use, as the name suggests is a functional outcome, a goal purpose or objective that is served directly through product consumption (Payne and Holt 2001).

Value-in-use literature declares value being realised when product or service is utilised. User is often the customer, thus causing the customer to take part in the value creation process. This effort where both service provider and customer collaboratively contribute to value creation is called value co-creation (Vargo and Lusch 2008). Customer's participation to value co-creation can also happen without the need for participation to the actual usage of the service. By giving input on how to develop the service or visibility on its operations customer can ease the supplier's part and thus enable more efficient value creation (Holmström et al. 2010).

However, value is not always co-created if certain conditions are not met (Grönroos 2011). Grönroos (2011) argues that all value creation really happens by the control of customer. Service provider's role can be a value facilitator that delivers value potential

that customer can turn into real value via value-in-use in its independent value creation. If strong enough interaction between both parties is achieved, customer may become a co-producer of the service processes and producer may become a part of the value creation process. When participating to customer's value creation process, service provider may move from being a value facilitator to a value co-creator. The model can also be seen below in figure 6.

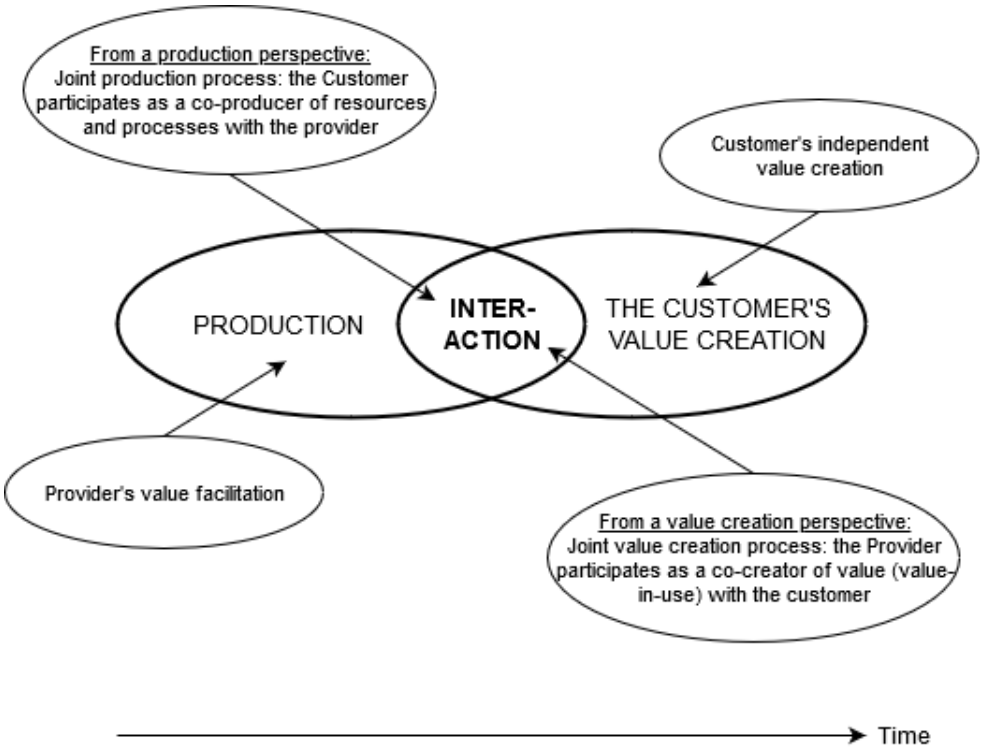

Figure 6. *Value-in-use creation model, adopted from Grönroos (2011)*

The idea of customer controlling the value creation resembles with the idea of CDL (Heinonen et al. 2010) presented earlier. It however contradicts to ideas presented by e.g. Jonsson et al. (2008) that it is the supplier who creates value and customer who has the opportunity to become an co-creator rather than just recipient. Based on ideas presented by Grönroos (2011), customer is in control of who can participate in value creation. Customer-centricity of value is also highlighted by the facts that value is accrued by customers value creation processes and that only customer can determine the value, uniquely to each situation. Earlier mentioned fact that value is always perceived by customer makes it difficult for supplier to assess how much value is created or facilitated in each situation.

2.3.2 Business model

Business model, despite being a frequent research topic and applied by every business, has no single unambiguous definition in literature (Teece 2010; Zott et al. 2011). Osterwalder et al. (2005) define business model as tool that expresses the business logic of a company. According to the authors, business model should describe what value is

provided, how it is provided and what are the financial results of the activity. Every company has and operates some kind of business model whether it is by a conscious choice or not (Reim et al. 2015). As business model expresses the logic of a company, it is a good unit of analysis to understand how a company functions (Kindström 2010). Chesbrough and Rosenbloom's (2002) more technology-oriented article sees business model as a framework that reconciles the technological inputs and economical outputs. They list six elements that the business model should state: value proposition, market segment, structure of value chain, cost structure and profit potential, firm's position in value network, competitive strategy. Business model building blocks listed by Osterwalder et al. (2005) correspond with these for the most part, with small variation such as inclusion of revenue model and a more underlined meaning of customer relationships. Teece (2010) stated that business model expresses the logic of a business and how it creates and delivers value to customers. From selected definitions, it can be concluded that in brief business model should at least describe how a company creates value, delivers value, and captures part of the delivered value as its profit (Osterwalder et al. 2010; Osterwalder et al. 2005; Teece 2010; Chesbrough and Rosenbloom 2002). As mentioned earlier, this thesis focuses more on the parts of value creation and capturing. Value delivery will be primarily analysed by investigating resources and capabilities needed to offer RM services. Below, is presented an illustration of components of business model.

Business model		
Value creation	**Value delivery**	**Value capture**
Customer needs and expectations *Segmentation* *Value proposition*	*Resources* *Capabilities* *Processes* *Activities*	*Earning logic* *Revenue streams* *Pricing*

Figure 7. *Components of business model*

Value creation consists of understanding customer needs and expectations, segmenting the market and offering inviting value propositions to desired segments (Teece 2010; Zott et al. 2011). It is not linear from supplier to customer but in includes intricate exchange and activity between various parties (Zott et al. 2011). Value delivery focuses on resources, processes and activities to fulfil identified customer needs and deliver the value. Value capturing includes the earning logic and revenue streams of the company as well as its cost structure i.e. how the company turns the delivered value into profits (Teece 2010; Osterwalder et al. 2005). Different customers will have different ability to pay and prefer different methods of paying, thus linking value capturing to value creation (Zott et al. 2011).

Value can be seen from two different perspectives. Value of the providing company to the customer and value of customer to the company (Payne and Holt 2001). Value creation part of business model can be seen as the first one. Value for customer is expressed in value proposition designed to best fit each customer. Value capture can be seen to deal with the latter perspective. The providing company analyses the best ways

to turn the service into profit i.e. gain value from services the firm provides to its customers.

2.3.3 Business model canvas

A widely used framework on business models is the business model canvas (BMC) by Osterwalder et al. (2010). The framework is used to identify key partners, activities, resources, value proposition, customer relationships, segments, channels, cost structure and revenue streams. The framework is generally used as a tool in business model development to offer a structured way to understand essential things of the business model. BMC is organised in a way that building blocks on the left side are related to company's internal aspects while the right side is focused on customers. In the centre of the model are the value propositions that serve as links between the company and customers. Business model canvas is presented below in figure 8.

<table>
<tr><td rowspan="2">Key Partners</td><td>Key Activities</td><td rowspan="2">Value Propositions</td><td>Customer Relationships</td><td rowspan="2">Customer Segments</td></tr>
<tr><td>Key Resources</td><td>Channels</td></tr>
<tr><td colspan="2">Cost Structure</td><td colspan="3">Revenue Streams</td></tr>
</table>

Figure 8. *Business model canvas, adopted from Osterwalder et al. (2010)*

Despite being a widely used tool to formulate and understand business models, BMC has also received some criticism. Hakanen and Murtonen (2015) state that BMC is goods-oriented and designed for product-based business. BMC is mentioned not to take into account some features of services such as value co-creation, the intangibility of services and the importance of service experience. Similar observations of BMC's goods-orientation were made also by Ojasalo and Ojasalo (2018). Criticism mentioned above has led to introduction of new business model frameworks that aim to better consider the attributes of service business. Service logic business model canvas by Ojasalo and Ojasalo (2018) proposes some changes to the original model. The core of the model is very much similar, with cost structure and revenue streams at the bottom, key partners on left and value proposition in the middle.

Proposed changes consider mostly the customer side of the model. Customer segments is replaced with “Customer’s world and desire for ideal value”, emphasising deeper understanding of the context of each customer and what they consider valuable for themselves. Customer relationships and channels are replaced with value creation and interaction and co-production respectively. These modules highlight facilitating value for customer and supporting them to reach their goals with the help of the providing company, instead more goods-oriented idea of just delivering the product to customer. Another service-oriented version is the Service business model canvas by Hakanen and Murtonen (2015). It features many similarities to previously explained model with a common aspiration to highlight collaboration and customer understanding in a more comprehensive way.

2.4 Business models and customer value in remote monitoring services

2.4.1 Creating value with remote monitoring services

Value-proposition has been found to be the core of the service platform (Löfberg and Åkesson 2018), and a study by Dijkman et al. (2015) even found it to be the significantly most important part of IoT service business model. Combined with the fact that RM technologies have the potential to support very innovative value propositions, a good value proposition can create great service business opportunities (Grubic 2014). However, creating concise value propositions is not easy (Anderson et al. 2006) and many manufacturers struggle on creating appealing value propositions (Grubic 2014).

Moreover, when companies develop new services, they should also position themselves more firmly as service providers in the eyes of customer with improved value proposition (Kindström 2010). Value proposition and offering should also not be considered fixed, but it must be flexible to fit each customer and their respective needs (Kindström 2010). Success of value proposition is of course affected by the customer’s readiness to RM services. Vaittinen and Martinsuo (2019) highlight that service providers should study their customers’ readiness for advanced services and try to help the customers to improve it in order to accelerate their sales. On the other hand, they acknowledge that lack of readiness in the service providers’ side can halt sales of advanced services as well.

Remote monitoring enables companies to create value propositions that offer big leaps in productivity for their customers. In a study by Hasselblatt et al. (2018) it was revealed that a power system provider promised 90% less breakdowns and 50% longer service intervals contributing to a total of 30% savings in maintenance costs. Another company providing propulsions systems was in turn able to promise 90% reduction to product failures. Another study reports on a case where product life cycle was extended by 50%, production costs were reduced, and annual processing capacity was increased (Sjödin et al. 2020).

Allmendinger and Lombreglia (2005) offer four different types of business models for RM services. Two of the proposed models, “embedded innovator” and solutionist” are designed for companies operating more independently while the other two, “aggregator” and “synergist”, are designed for more inter-company collaboration. Embedded innovators are mentioned to refine existing products with intelligence better connectivity. The business model typically keeps the product in the centre and only consist of limited added services such as remote support. One step forward is the “solutionist” business model where the OEM becomes a partner for the whole life cycle from financing the purchase to offering maintenance and updates throughout the life cycle. Automation systems services of Honeywell are mentioned to be an example of this type of business with their service that offers remote monitoring, support and optimisation for oil refinery customers. Another example could be Joy Global’s service for mines that offers optimisation of a system of multiple machines working underground. (Porter and Heppelmann 2014).

Collaboration oriented business models by Allmendinger and Lombreglia (2005) are not as strictly tied to single products. “Aggregators” collect data from various sources and combine it to analyse it and offer services or sell the data for third parties. As the model focuses on analysing the data, large investments to data mining, warehousing and other such activities are required. The last of the four, “synergist”, focuses on offering connections between other intelligent products. In industrial context it could mean that data from different suppliers’ products could be combined to create a holistic picture of how the whole system is running. The “system of systems” in agriculture presented by Porter and Heppelmann (2014) resembles to the idea of a “synergist”. The idea includes different interconnected farm systems e.g. weather and irrigation systems managed by a central “Farm Management System”.

The models proposed by Allmendinger and Lombreglia (2005) may not exist precisely as such but offer foundation to understanding possible business models for RM services. Some models tend to have a core product to which they focus whereas some models are more interested in collaboration between different actors. Ownership of data and participation to different phases of the life cycle are other factors that create differences to business models.

In addition to presenting the value to customer value proposition must also offer some proof that value can actually be delivered. In the case of RM services, value can be difficult to prove as many of the benefits consist of prevented unfortunate events such as breakdowns and the production losses due to them (Grubic and Peppard 2015). That is even though preventive maintenance is exactly where the biggest potential of remote monitoring is expected to be (Grubic 2014). Moreover, proving the value is not only about arguing that there were any prevented events in general, but that it was the particular service that contributed for that prevention and not some other possible backup system. Grubic and Peppard (2015) present an example case from the marine industry, in which companies have prepared some backup systems in case of failures in propulsion systems so sharing the value provided from different precaution may be difficult. And when contracts include profit and loss sharing, calculating benefits becomes especially im-

portant and often difficult (Grubic and Peppard 2015). But offering tools that give customer reliable figures such as the return on their investment have been used successfully in advanced services (Reinartz and Ulaga 2008). The difficulties of value proving in RM services were even named as the remote monitoring technology challenge, further highlighting its significance (Grubic 2018).

Uncertainty of proving the delivered value is linked to one key value driver of RM services: transferring risks between the service provider and the customer (Grubic 2014; Visnjic et al. 2017). The service provider takes responsibilities of some customer process and assumes the risks of e.g. breakdowns in exchange for a compensation. This is made possible by remote monitoring. Having contracts that shift the risks can thus be used to tackle the issue of uncertainty to some extent. When the supplier takes complete responsibility of the customers process, discussion can move to the outcomes with less need to argue why breakdowns happened or were avoided, and which actor should be rewarded for that. However, suppliers often do not have full control over the processes. Visnjic et al. (2017) report on an example case where construction and mining machinery provider offers the assets but the operators are still customer's employees. This makes the supplier dependent on the customer even though it has agreed to a contract with risk transferring. That is why contracts including risk transferring to the supplier should be treated as collaboration with common risks and goals and not shifting all responsibility to the supplier (Sjödin et al. 2020).

As previously mentioned, value creation in RM services is often not just carried out by the service provider but created together in collaboration with other providing companies or with the customer. The change can dim boundaries between companies and lead to new types of make-or-collaborate-or-buy decisions for managers (Kohtamäki et al. 2019). In fact, it has been claimed that collaboration with different stakeholders is required to successfully implement product-service systems to take full advantage of creating, delivering, capturing value from PSSs (Reim et al. 2015).

Partners for collaboration may include e.g. material suppliers and companies to which some tasks are outsourced. Digital servitisation increases the importance of external parties and calls for collaboration between companies. The new digital offerings also need to fit with other suppliers solutions as was in the previously mentioned example of a "Farm Management System" (Porter and Heppelmann 2014). This increase in collaboration dims intercompany boundaries and thus affects the business models of involved firms. Technologies, routines, value propositions and earning logics are the main points that are stated to need revision when developing the business model to better support RM services (Kohtamäki et al. 2019). When operating in ecosystems, actions of one company also affect other companies in the same ecosystem. The increase in collaboration due to digitalisation also creates a need to reassess the business model more often as companies must adapt to evolving ecosystems (Kohtamäki et al. 2019). Increased collaboration is linked with perceptions of business models' tendency to move from closed, hierarchical form to an open and heterarchical model (Leminen et al. 2018).

However, executing partnerships can be difficult in reality. Adding multiple actors from different parties can easily result as conflicts of interest (Visnjic et al. 2017). But resolving those conflicts can enable great value creation in RM services. Grubic and Peppard (2015) state that remote monitoring should be approached as a process of value co-creation between manufacturer and customer. As the customer is involved in the process, the relationship and roles should be defined clearly and managed collaboratively in order to success (Grubic and Peppard 2015). Creating business models with collaborative value creation is also emphasised by Leminen et al. (2018) who state that companies should create service business models with creating value for multiple actors in the ecosystem. Earlier it was discussed that the supplier can either facilitate potential value and value-creation opportunities to customer or become a value co-creator through strong interaction with the customer. Löfberg and Åkessån (2018) found out that remote monitoring service providers with more resource integration between the service provider and customer were more successful than competitors with less resource integration, further suggesting the importance of value co-creation.

Critical to collaboration is understanding that high level value creation is possible only if the supplier is given access to collaborate with the customer. Holmström et al. (2010) present a model that distinguishes different levels of services, constellations, offered by the supplier and the needed level of access and visibility to customer's system required to achieve each level. Model consist of two dimensions, asset management demand and service supply, with four levels each. The model is presented below in figure 9.

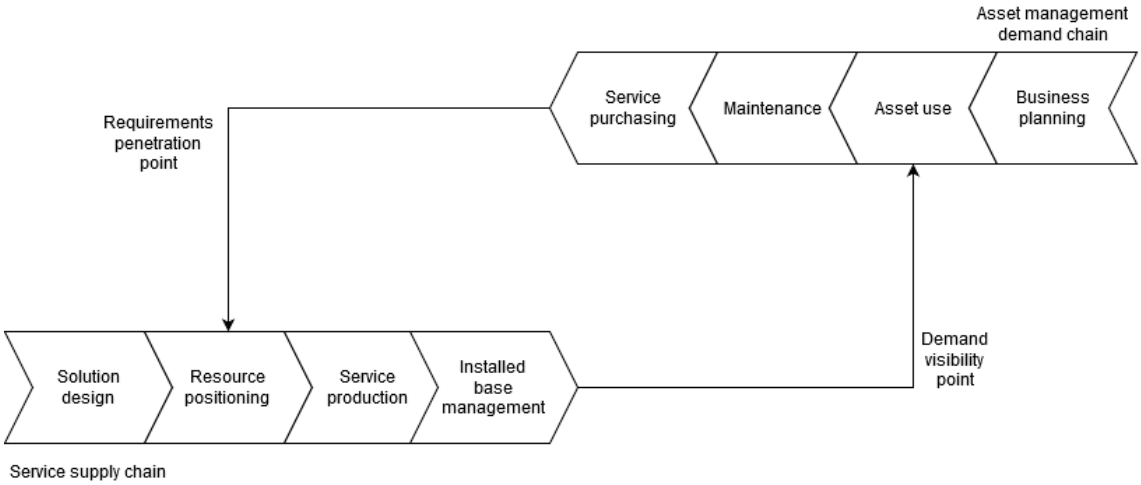

Figure 9. *Framework for visibility-based services, adopted from Holmström et al. (2010)*

The upper arrow in the figure shows the point where the service provider receives customer input on their needs and gets to allocate their resources to match the service requirements. The lower arrow in turn presents the demand visibility point, i.e. the point where service needs are made visible to the service provider. It is argued that if more information is shared earlier it leads to more efficient use of service resources and value for both the customer and the supplier (Holmström et al. 2010).

The authors also provide examples of different types of industrial services related to the model (Holmström et al. 2010). An example of condition-based maintenance for military aircraft where the customer allows the supplier visibility to information on asset condition and usage data. This penultimate level of the model, condition based maintenance, is very much equivalent to predictive RM services mentioned by e.g. Grubic (2014) and Kiel et al. (2017). A more advanced example is provided on management of a fleet of leased forklifts and their operators to multiple customers. Customers are required to give the supplier access to their business planning but the increased visibility but allows the supplier to move the resources between customers and to deliver just as much capacity as each customer needs at the time. This constellation offers great potential in improved efficiency, but it seems difficult to apply to larger and more stationary assets.

2.4.2 Delivering value with remote monitoring services

Shift from traditional business models and revenue models to newer options, e.g. from selling equipment to renting them, requires suppliers to invest in service and maintenance activities as well as financing to leverage new business model (Kindström 2010). It is argued that companies should adopt a holistic business model angle to service development as new services do not only affect the way services are delivered but they also change the value propositions companies can create and the earning logics used to capture the value (Kindström 2010; Grubic 2014). Despite business model consisting of recognisable parts (i.e. value creation, value delivery and value capture) changes to business model must be comprehensive: making changes to only one feature of a successful business model is unlike to result in an improved coherent business model (Kindström 2010). In practice this can mean e.g. that new innovations in service offering should be complemented with changes to how the services are executed, the capabilities of organisation and how the firm bills these services. Need for pervasive changes makes business models also more difficult to imitate and thus enables creation of more sustainable competitive advantage.

In order to become customer-oriented, service providers should increase collaboration with them. Hasselblatt et al. (2018) state that companies should incorporate their key customer into their business model development processes to build successful IoT business models and understand key customer needs. The need to incorporate customer to the solutions was mentioned to be especially important in the context of process industries (Hasselblatt et al. 2018). Scholars also call for experimenting with multiple different business models to increase business model innovation in the company and to avoid rigidity (Kohtamäki et al. 2019).

Shifting to new type of offering, new organisational capabilities are required (Porter and Heppelmann 2014). Most frequently mentioned capability was understanding of larger customer systems and processes. It refers to shifting focus from single assets to larger entities and subsystems formed by the products. Understanding the products is not sufficient: understanding processes and how products relate to them is critical in order to be able to offer accurate value propositions and to prove the delivered value (Grubic and

Peppard 2015). Selling capabilities was also a factor that came up in the literature. Selling capability is linked to understanding the customers but also includes factors such as communicating the value of the solution (Hasselblatt et al. 2018). Technological expertise is another required capability of the organisation and its employees. It includes individual skills but also infrastructure of applications, databases and analytics with interfaces to other enterprise systems (Porter and Heppelmann 2014). Manufacturers providing RM services need a business model that is based upon effective data acquisition, warehousing and analytics (Hasselblatt et al. 2018). Computing is not just supportive in value creation of RM service business but it can arguably be the base of it (Jonsson et al. 2008).

Value creation in RM services is however not just based on computing but also to partnerships and collaboration with customers and other actors. Developing a comprehensive network is seen as an important capability to be able to provide adequate service and filling the customer needs without the need of having all the capabilities inside own organisation (Kindström 2010). Thorough network can be especially beneficial in the early stage of providing services as internal infrastructure may not be able of delivering all the needed features. Collaboration can also be internal in some companies. According to Iung et al. (2009) the shift to preventive maintenance is linked with collaboration and integration in inter- and intracompany processes. Porter and Heppelmann (2015) add that manufacturing of smart products requires more coordination within organisation than with traditional products. They state that with smart products, organisations need to communicate between different units in intense and constant manner.

Scaling the services must be done cost efficiently in order to make the services profitable as they grow. Services with high added value also often need to be customised to some degree to meet the customers' needs (Rönnberg Sjödin et al. 2016). Customisation must therefore also be possible with relatively low costs. Having a service platform can be seen as a factor to help in that challenge. Modular service resources, integrations and processes have been proposed as foundations of successful service platforms (Löfberg and Åkesson 2018). Another repetitive theme in the business model development literature is agility: new services with earning logics are needed to be developed and tested quickly and customers must be engaged to achieve results fast (Hasselblatt et al. 2018). The RM service capabilities identified in literature should not be treated in isolation but in coordination with each other (Paiola and Gebauer 2020). It is argued that capabilities related to e.g. data-analysis can help companies create better value propositions and thus ease the work of salespeople (Paiola and Gebauer 2020). Table of the identified capabilities including the literature references can be seen below.

Table 1. *RM service capabilities*

RM service capability	Source
Understanding larger customer systems and processes	(Grubic and Peppard 2015; Porter and Heppelmann 2015; Reinartz and Ulaga 2008; Hasselblatt et al. 2018)
New selling capabilities	(Porter and Heppelmann 2015; Hasselblatt et al. 2018; Reinartz and Ulaga 2008)
Technological infrastructure and capabilities	(Porter and Heppelmann 2014; Porter and Heppelmann 2015; Rönnberg Sjödin et al. 2016)
Managing ecosystem of partners, relationships and collaboration	(Rönnberg Sjödin et al. 2016; Leminen et al. 2018; Kindström 2010)
Cost efficient scaling and customisation	(Rönnberg Sjödin et al. 2016; Reinartz and Ulaga 2008)
Building a solution platform	(Hasselblatt et al. 2018; Luz Martín-Peña et al. 2018)
Agile creation of new services and business models	(Rönnberg Sjödin et al. 2016; Hasselblatt et al. 2018)

2.4.3 Capturing value with remote monitoring services

As remote monitoring services are still relatively new additions for many companies, it is clear that the research on value capture in RM services is also somewhat scarce. There are however different strategies and logics on how to earn with RM services. Three of the most common approaches to pricing in industrial business are cost-based, competition-based and value-based pricing (Liozu and Hinterhuber 2012). As their names suggest, cost-based takes the suppliers cost structure as the basis and adds a profit margin on top of that. Competition-based uses the idea that prices should not be too high compared to competitors and value-based pricing tries to measure the value brought by the service and share it between the supplier and the customer in a fair manner. These approaches can also be applied similarly, e.g. pricing may be based on costs but still aligned to the general market prices. Even though it is hard to define a single best way for pricing, a positive relationship has been reported to exist between value-based pricing and corporate performance (Liozu and Hinterhuber 2013).

A study by Laurila (2017) investigated different earning logics for industrial internet based services. The study included different earning logics such as time-based, transaction-based, usage-based and outcome-based models. Time-based earning logic includes a

certain level of service for a fixed annual or monthly price. Transaction-based earning logic requires each activity to be ordered and billed separately. Usage-based logics consist of an existing contract where service actions are priced according to their carrying into effect. Outcome-oriented pricing on the other hands includes service provider aiming to deliver best possible outcome and the customer paying an amount that depends on the performance. The two mentioned dimensions are related, but slightly different. In other words, it is a different question that how high are the prices and how is the level determined than what is the supplier charging for. For instance, monthly price may be set up based on expected costs to the supplier or added value to the customer.

Business models for RM services and product-service systems can be divided into three different classes based on their earning logic's focus on products, usage or results (Reim et al. 2015). These approaches differ from each other on level of service-orientation and what the service provider is actually selling. In the first option, products are in the centre of the offering and services are developed to support products. Services create some new revenue but also support the sales of products. This product-oriented PSS business models fits to the idea of services as an add-on presented by Oliva and Kallenberg (2003).

The second approach focuses on selling usage instead of actual equipment. Service provider selling usage keeps the ownership of products to itself and offers them to customers by renting and leasing. Some services are often included such as maintenance to ensure their availability. Taking the responsibility of availability changes the nature of customer relationship from transactional to ongoing. However, customer still operates the assets, supplier just makes it possible. In this model, customers pay fixed payments over time given that the availability is as agreed. IoT is mentioned to promote the prevalence of these types of pay as you use -services (Xu 2012).

The third type of PSS business model is result-oriented (also referred as outcome-oriented), and its main focus lies in delivering the best possible outcomes to customers. In this set up, service provider promises to deliver actual results and thus controls the operations needed to achieve those results. Means to achieve results are often for the service provider to choose though adoption of customers technologies may be necessary depending on context. Payments are also dependent of the results: the more value is delivered to customer, the bigger the payment is. Overall, outcome-oriented business model can be classified to be riskier and to require a more open business model, but it also has a high earning potential (Sjödin et al. 2020).

When pursuing new types of earning logics, companies should view their whole business models and see that all of its parts are in line with each other (Visnjic et al. 2017). Reinartz and Ulaga (2008) write that traditional pricing methods are suitable when the organisation sees services as products: focuses on units sold, hours used and the costs of providing service. This approach is similar to product-oriented business model presented earlier. In advanced services, where the company tries to solve customers' complex problems, the degree of results should be considered when billing services (Reinartz and Ulaga 2008). That, however, shifts some of the risks for the service provider. This in

turn reminds of result-oriented business model. Usage-oriented business model can be placed between the other two. In usage-oriented business, attention is not in problem solving, but providing availability. For example, dividing the costs of acquiring an asset over time when renting it, is relatively easy and can be priced based on costs. Costs of maintenance to keep the assets available despite faults, breakdowns and wear can on the other hand be harder to estimate beforehand, without knowledge from data collected from previous cases. In these cases where avoiding losses of availability is very valuable and the border between providing availability and outcome may become fade as outcome is derived from availability. If so, outcome-oriented model could be a more suitable for service relation (Reinartz and Ulaga 2008). A company can also offer the customer two or more possible options where one could be more traditional based on times service is used and the other one can be a full-service contract with monthly or annual invoicing (Reinartz and Ulaga 2008).

Oliva and Kallenberg (2003) suggest that companies should pursue pricing RM services based on availability or performance instead of costs to supplier in order to make the offers more tangible. A widely used early example of outcome-based pricing in RM services is Rolls-Royce with its “power by the hour” -model where the company offered engine and service as a package with a fixed price per flight-hour (Neely 2009; Porter and Heppelmann 2015; Visnjic Kastalli and Van Looy 2013). It is to be noted that in case of Rolls-Royce availability and outcome are the same thing for the most part: planes are required to be in operation, but not to break records on speed or carrying capacity. A different example is for example a rock crusher that may be available as planned, but only capable of producing half of the desired outcome in tonnes crushed. It is therefore important to note what is meant by availability and outcome in each situation.

Kindström (2010) states that service companies can start to apply more advanced revenue mechanisms as supplier becomes more aware of customer’s business and customer becomes more used to buying services. Also, supplier should know its cost structure well to apply the appropriate revenue mechanisms. Even though advanced pricing methods can lead to more rewarding customer relations, they are also more complex and require agreements on what will be measured and how and which factors determine the basis for invoicing (Kindström 2010; Reim et al. 2015). Availability-based pricing requires service provider to assume the operational risk of the equipment (Oliva and Kallenberg 2003). Thus, ability to assess risks correctly becomes a key to success as profitability depends on the accuracy of risk assessment (Oliva and Kallenberg 2003). A study by Visnjic et al. (2017) reveals that companies aim to have long contracts to get the maximum benefit of outcome-based contracts, as long contracts help to tackle the high set up costs and guarantee long-term balance for business. An example from Hitachi states in the article that they pursue deals of even 25 years and a respondent from Catepillar mentions that they do not seek deals that only cover one or two years.

All in all, adopting advanced pricing methods remains a challenge for many companies. A study by Kiel et al. (2017) found very little changes to manufacturers’ revenue streams. They suspect that this is due to doing business with existing customers who are used to previous policies and the risk-aversive behaviour of the manufacturers. Another study

reported on six cases where outcome-oriented business model had been experimented between industrial companies, with only two of those resulting in successful ongoing service relationships (Sjödin et al. 2020). Among the main reasons for the failures of those experiments were inability to define potential gains and to translate value creation opportunities into jointly agreed contracts that benefit both parties equally. The authors recommend creating the value proposition for collaboration together, considering value creation and capture simultaneously, and to continuously secure that the contract is fair for both parties to ensure lasting relationship (Sjödin et al. 2020).

2.5 Synthesis

2.5.1 Summary of customer needs literature

After analysing literature of different themes such as servitisation, customer value and business models, it is necessary to combine that to reach comprehensive understanding on those matters and how they link with each other. The synthesis will consist of two subchapters that summarise the literature regarding customer needs and business models in remote monitoring services respectively. Customer value articles are addressed in a separate table even though that theme is strongly linked to business models. It is however considered so significant in this thesis that it is chosen to be analysed separately while acknowledging the link. For this analysis only articles that cover the main themes of this study (remote monitoring, business models, customer value creation and its sources) were selected, leaving out e.g. articles with the most basic theory. Most of the selected articles are also relatively recent. Only few articles are from earlier than 2015. This highlights the novelty of the subject. Of the newer articles, case studies and literature reviews are almost equally represented. The tables are used as a tool to analyse the key findings of the literature. Tables also contains information on what relevant factors were not researched in those studies to identify research gaps to which this study could answer. Main literature of value creation used in this thesis are listed below in table 2 with their viewpoints and findings.

Table 2. *Analysis of main value creation literature*

Source	Theme	Methodology	Relevant findings	Research gap
Jonsson et al., 2008	RM service value creation	Single case study of manufacturing industry	Ubiquitous computing can be a base of value creation and create new business offers	Customer viewpoint
Grönroos, 2011	Value creation and co-creation in service business	Literature review	Supplier facilitates the value creation of customer and may become a value co-creator	RM service perspective
Grubic, 2014	Servitisation and RM technologies	Literature review	Main benefits of RM are minimising downtime, managing risks (customer) and improving performance, reducing costs, gaining insights (Supplier)	Business models for RM services Collaboration
Grubic and Peppard, 2015	Servitisation and RM technologies	Multiple case study of multiple industries	Enablers and constrains of RM services	Customer viewpoint Servitisation effects on value capture
Visnjic et al., 2017	Service providers' value drivers in outcome-based contracts	Multiple case study of manufacturing industry	Five dimensions (complementarity, lock-in, efficiency, accountability, novelty) that bring value to service providers	Customer viewpoint
Grubic, 2018	Servitisation and RM technologies	Multiple case study of multiple industries	RM benefits (mitigation of risks, increased knowledge of service performance, efficiency) Acknowledges value proving challenge	Customer viewpoint Value proving
Klein et al., 2018	RM service barriers	Multiple case study of multiple industries	Four classes of factors that halt success of RM services (internal resources, customer and information, value proposition, adaptability)	Customer viewpoint
Momeni and Martinsuo, 2018	Remote monitoring in value creation for industrial services	Multiple case study of engineering companies	Value drivers of remote monitoring services for service providers	Customer viewpoint Customer information collection Barriers of RM services

It is noteworthy that most of the studies regarding value creation are case studies. It can also be seen from the table that some factors are repeatedly covered in findings and that some factors are missing from most studies. Many studies have researched the benefits that RM services can create to both the providing company and to customers, but these results are mostly based on thoughts of people inside the providing companies (Jonsson et al. 2008; Visnjic et al. 2017; Grubic 2018). While people in providing companies often are in contact with the customers and have knowledge of their needs, it is still the customers who know their needs best. It can be identified that there is a need for information on customers' needs directly from the customers. Increased focus on customers would enable to study not the possible benefits of RM services but the actual needs for RM services and thus understand the priorities of identified benefits. Barriers and constraints of RM services are also researched to some extent, but mostly with the focus on the suppliers (Klein et al. 2018; Grubic and Peppard 2015). Reasons why customers choose not to purchase RM services seem still somewhat unclear. The lack of research with customer perspective and real customer data on the customer needs and value drivers of RM services and the factors that halt the success of RM services is therefore identified as the first research gap to be answered with this thesis.

2.5.2 Summary of business model literature

Similarly to previous subchapter, main literature of business models in remote monitoring services are first presented in a table below and then analysed.

Table 3. *Analysis of main business model literature*

Source	Theme	Methodology	Relevant findings	Research gap
Allmendinger and Lombreglia, 2005	RM service business models	Literature review	Four different strategies for offering RM services (embedded innovator, solutionist, aggregator, synergist)	How companies come up with their business models
Kindström, 2010	Service business models	Multiple case study of manufacturing companies	Business model development priorities between different parts of business model	Scaling and generalising the results and services
Dijkman et al., 2015	IoT business models	Multiple case study from multiple industries	Value proposition most important block of BM IoT business model framework	Customer viewpoint
Porter and Heppelmann, 2015	IoT business models and strategy	Literature review	Capabilities of IoT service providers Comparison between traditional industries and software industry	Creating value from data
Reim et al., 2015	Business models for product-service systems	Literature review	Business model frameworks product-, use-, and result-oriented PSS business models	RM service perspective
Hasselblatt et al., 2018	Needed capabilities for IoT	Multiple case study of manufacturing companies	Five strategic IoT capabilities identified (digital BM development, building scalable platforms, IoT value selling, IoT value delivery, business intelligence	Customer viewpoint Combining capabilities for RM service business model
Leminen et al., 2018	IoT business models	Literature review	Business model archetypes and evolution paths to them	Customer viewpoint Real-life case-examples of BMs
Löfberg and Åkesson, 2018	Service Platforms	Multiple case study of food processing and packaging and pulp and paper industries	Modularising resources and processes can create value for service platform	Customer's and other actors' viewpoints Collaboration
Kohtamäki et al., 2019	RM service business models	Literature review	Three-dimension BM framework (customisation, pricing, digitalisation) for RM services	Practical cases of BMs Customer viewpoint
Sjödin et al., 2020	Outcome-oriented business models	Multiple case study from multiple industries	Success factors to collaborative outcome-oriented service relationships	Applications of remote monitoring

Analysing the selected literature of RM business models, the number of recent case studies, especially in the context of process industries, is limited. The research of this area seems to be still very much theoretical (Leminen et al. 2018; Kohtamäki et al. 2019), possibly due to the novelty of the subject and lack of companies with comprehensive experiences of RM services. It is also possible that the issue is linked with the research gap identified previously: if companies are uncertain of the true customer needs, they may struggle with their value propositions. As the importance of value proposition is highlighted in RM services (Dijkman et al. 2015), inadequate value proposition is likely to lead to difficulties in forming a suitable business model. How companies create their value propositions and offering and capture the value of advanced services remains still somewhat unclear. A research gap considering the value creation and capture in remote monitoring services for industrial companies is therefore identified. This thesis aims to offer clarity to this issue through a case study of a company that is developing its RM services. Aim is to identify the most important needs, how the value should be proposed and captured in a service relationship.

Based on the literature review, it can be noticed that remote monitoring is indeed a phenomenon that has received increased interest during the last few years. It was identified that remote monitoring is a continuation of two large trends servitisation and digitalisation (Kohtamäki et al. 2019). Increased attention to services has changed how companies see their businesses and technological development in communication, data storing, and data analysis has made it possible to fulfil customer needs in a more advanced level. The customer needs of operating their plants with higher utilisation and more output are not new, but the solutions on how to fulfil the needs are enabled by new solutions.

It was also learned that RM services can be beneficial for the providing companies with more ways than just creating new business. RM services can be used to e.g. achieve cost efficiencies and to facilitate organisational learning and creating and improving own products and services (Grubic 2014; Momeni and Martinsuo 2018; Löfberg and Åkesson 2018). In addition to enabling new business, RM services can also accelerate change in the way companies do their business. Business models were identified to be different for RM services, with increasing attention to e.g. intercompany collaboration and partnerships (Kohtamäki et al. 2019). Collaboration was often seen deeper in the case of RM services compared to traditional services.

Customer value is another theme that proved to be crucial in remote monitoring services. Especially creating good value proposition was considered important in many studies (Klein et al. 2018; Dijkman et al. 2015; Löfberg and Åkesson 2018; Grubic 2014). Customer value is however not a separate concept but very closely linked to the concept of business model. Companies should work to understand their customers' needs and understand that they may vary significantly between different customers. Understanding the different needs and thus the different value that similar services provide to different customers is critical in order to deliver maximal value to each customer.

With the mentioned observations, a conceptual framework, Remote monitoring service business model canvas is proposed in figure 10. Framework is based on the original

business model canvas by Osterwalder et al. (2010), and the service-oriented frameworks presented by Hakanen and Murtonen (2015) and Ojasalo and Ojasalo (2018).

Key partners	**Capabilities and processes**	**Value propositions**	**Value co-creation**	**Customers and their needs**
Captured value of the service provider				

Figure 10. *A conceptual Remote monitoring service business model canvas*

The leftmost block, “Key partners” is similar to those presented in the frameworks of Osterwalder et al. (2010), Hakanen and Murtonen (2015) and Ojasalo and Ojasalo (2018). It includes different partners and suppliers that the company uses to get access to capabilities it currently lacks. Second block from the left, “Capabilities and processes” highlight the capabilities needed to offer RM services and the actual processes that are used to deliver value to customers. In the middle, value proposition is much similar as in previous frameworks as it has been found out to be critical for advanced service business (e.g. Dijkman et al., 2015).

Value co-creation was found out to be one of the themes associated to advanced services (Grubic and Peppard 2015; Löfberg and Åkesson 2018). Value co-creation is placed between value proposition and customer needs as it is the step where proposed value is turned into actual value to fulfil the needs of the customer. The rightmost block is titled “Customers and their needs” contains understanding of who are the customers and what are their specific needs. The types of services, communication and pricing they prefer and the depth of collaboration they are ready to engage.

The framework is based on the block of “Captured value of the service provider”. This adopts the idea of value as a sum of different types of gains and sacrifices by Kotler and Keller (2006) and is more suitable for highly scalable remote services than looking at the unit costs like in product business. The block also includes different earning mechanisms that the company has but recognises other types of value too e.g. organisational learning, as mentioned earlier in chapter 2.3.1.

The framework tries to refine the earlier models to create a model that better supports new kind of service business. As such, without being filled, it does not yet offer answers but acts as a potential tool for business model development. The results of the empirical

part will later be analysed together with framework in order to gain understanding of suitable business model for remote monitoring services.

3. RESEARCH METHODOLOGY

3.1 Research design

This thesis adopts mostly an interpretivist philosophy. In practice, this means that it is acknowledged that different people in different roles are different actors and not objects: they interpret reality differently and can therefore have different views (Saunders et al. 2009). In many cases, interpretivism sees the world of business and management as too complex for simple generalisations. Interpretivist philosophy tries to understand the phenomenon in a given context while understanding that the researcher may also affect it (Saunders et al. 2009). One main area of this research is to explore the needs of the customers of the case company. That requires understanding what the customers think and feel. Moreover, it is important to understand how people in the case company see the situation. Interpretivist philosophy is seen to fit this purpose well.

This thesis takes an inductive research approach. Contrary to theory testing of deduction, inductive reasoning usually aims to build new theories in fields where there is not enough information available (Saunders et al. 2009). Resembling with the earlier mentioned interpretivist philosophy, inductive approach is suitable for social sciences and research problems associated with human behaviour. Inductive approach is often closely related to the context of the research and tries to get a deep understanding of the context. What is really important, is not defined by the researcher beforehand, but important things will be explored during the research. The need for generalisation on the other hand, is not quite as important as it is in the deductive approach (Saunders et al. 2009). This study has a context where no suitable theory for case organisation yet exists. Inductive approach is seen fit for the context. The study aims to get understanding of this particular case and then if possible, make generalisations or build a theory for broader audience.

Research conducted in this thesis is selected to be exploratory. Exploratory research focuses on lesser known subjects and aims to find new viewpoints and phenomena on the themes of the study (Hirsjärvi et al. 2018). Exploratory research is fit for situations where the goal is to clarify understanding of the problem and is often used with literature review and interviews as its methods for data collection (Saunders et al. 2009). Like exploratory studies very often, this study is also conducted using qualitative methods as they are suitable to exploring new knowledge rather than proving existing hypothesis (Hirsjärvi et al. 2018). Main goal of the study is not to create a general theory but to find information on the selected case while keeping in mind that general theories are formed from individual cases.

Single case study was selected as the research strategy of this thesis. Case study can be defined as an “empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and the context are not clearly evident” (Yin 2003). Case studies are often used to acquire intensive

and detailed information of the object of the study (Hirsjärvi et al. 2018). Some of the most common data collection methods in case studies include observation, interviews, document and archive analysis and surveys. For the empirical part of this study, interviews and documents were selected to be the data sources, with main focus on interviews. For literature the literature review, scientific articles and books were used to gather information.

The two main reasons case study was selected as the research strategy are its suitability to the research problem and to the requirements of a Master of Science thesis in technology. Firstly, case study was seen appropriate as the research context is unique and relatively complex. A deep and holistic understanding of the context that a case study allows was seen as a great benefit. Single case study was selected to be the best option, as the researcher had far greater access to the selected case company than to other companies due to being previously employed by the case company. The researcher's experiences on the case company have also created significant knowledge on the company easing the research work.

Yin (2003) also recognises some challenges related to case studies. The method is prone to mistakes related the researcher such as allowing personal biases to affect conclusions or not following systematic procedures strictly enough. It is also admitted that case studies often offer less basis for scientific generalisation. A single case study itself is often exploratory and requires comparison to literature and other case studies in order to build comprehensive theories.

3.2 Companies involved in this study

3.2.1 Service business in the case company

The case company was briefly described in the introduction chapter. This chapter will focus more on the service business of the case company. The service business of the case company has a few hundred employees, including personnel serving both domestic and foreign customers. Traditional service offering consists of offering e.g. repairs, maintenance and technical support. Some key figures of the case company are presented below in table 4. Data is generalised for privacy reasons.

Table 4. *The case company in numbers*

The case company (CC)	
Industry	Electrical equipment
Personnel 2018	> 50 000
Revenues 2018 (M€)	> 25 000
Share of service revenue 2018	19 %

Nowadays, increasing part of the services are related to digitalisation. The case company has combined all of its digital solutions, a total of over 200, under one umbrella brand. It

includes equipment, systems, solutions, services and a platform that can be used to improve the performance of customers' businesses by connecting industry-specific knowledge with connectivity features. The brand was launched in 2017. In the heart of this thesis is the remote monitoring service centre located in Finland, also opened in 2017. The centre aims to offer remote support and monitoring to the customers of the case company. The centre strives to respond to the need of advanced services such as predictive maintenance that use data from productions processes and equipment. One of the main themes of the centres is promoting collaboration across the case company departments and also with the customers. In addition to Finland, the company has a few similar centres in multiple countries and continents to enable a global presence and a capability for monitoring at all times. The customers for the Finnish centre operate in process industries, especially in pulp and paper industry. However other types of process industries are included in the customers as well, with slightly different customer bases for each geographical area.

Even though a large variety of different offerings already exist, there is still some ambiguity on what the true customer needs are. This thesis aims to investigate the customer needs for those new types of services and to determine through what type of business model they should be offered.

3.2.2 Customer companies

All the customer companies were operating in process industries in either manufacturers or in maintenance. Company A offers industrial maintenance service for process industries, especially for pulp and paper. The company was founded jointly by a forestry company and a maintenance company and combines the expertise of the two industries. Company A offer its services to the company that owns the plants while the case company offers its services to company A as a subcontractor. Company B is large company operating in forestry industry. Its main products include pulp, carton, plywood and tissue paper covering large part of the value chain. Company B has global presence with a special importance in Europe. Company B also owns a large share of Company A, creating a link between the two companies.

Company C is specialised in providing maintenance for companies in pulp and paper industries. Similarly to company A, it started as a joint venture of the case company and a forestry company. The secondary data used in this thesis includes data from two interviews from two different maintenance sites of company C. As in the case of company A, company C is also a service provider and the case company its subcontractor. Company D operates in petrol industry. It has refineries both in Finland and globally. It is one of the leading players in the market of renewable fuels. Company E was founded in a merger of petrochemical businesses of company D and another company from the petrol industry. It has plant in both Finland and globally. General data is of the participating companies is presented below in table 5. No detailed data is offered to protect the privacy of the companies.

Table 5. *List of customer companies*

Company	Industry	Personnel 2018	Revenue 2018 (M€)	Primary data	Second-ary data
A	Industrial maintenance	100 - 500	< 100	x	
B	Forestry	5 000 - 10 000	5 000 - 10 000	x	
C	Industrial maintenance	500 - 1 000	100 - 500		x
D	Oil and Gas	5 000 - 10 000	10 000 - 25 000		x
E	Petrochemi-cals	5 000 - 10 000	5 000 - 10 000		x

3.3 Data collection

3.3.1 Interviews

Main sources for data collection in this thesis are interviews, with additional data from secondary source of documents. Interviewees were for both case company personnel and customer companies' personnel. Documents consisted of notes and other materials collected from customer interviews and discussions related another development project with somewhat similar themes than those in this thesis. All the data used in this thesis is of qualitative nature.

Interviews are considered as one of the most important ways to collect information for case studies (Yin 2003). Interviewing is a good and flexible method for finding out what people think, feel and believe and how they experience certain things and situations (Hirsjärvi et al. 2018). Some of the other benefits of interviews are the possibilities of asking further questions for more accurate answers, finding new, previously unimagined viewpoints directly from key people.

Data was collected through a series of semi-structured theme interviews. Eight interviews with eight respondents were decided to be a suitable number to get enough data for cogent conclusions. As the data collection progressed, certain level of saturation in results was noticed, implying that the number of interviewees was sufficient. Reasons why semi-structured interviews were selected ahead of structured or open interviews were to achieve more flexibility compared to structured interviews by focusing more on areas where the respondent had more insights while still having some structure to guide the conversation.

Interviews also have a limitation of the interviewee not being completely accurate or true to life in their answers. Interviewer is also always affecting the situation with their own behaviour which may have an effect on the answers. Moreover, the interviewee can possibly experience the interview situation as intimidating or threatening and therefore hide

some important things. In group interviews the threat of respondents not expressing critical thought even larger than when discussing alone with the interviewer. This requires the interviewer to be “strict” enough to get truthful and specific answers and “friendly” enough to ensure that the respondent is feeling comfortable. Another more practical limitation is the time needed to prepare, execute and analyse the interviews. Respondents are often busy, and it may be difficult to find time slot for interviews. In this thesis, half of the interviews were carried out face-to-face, in other cases phone or skype interview was seen more practical due to long distances or scheduling difficulties. A voice recorder was used to enable full focus to the conversation during the interview and to ensure that answers were later understood accurately. Respondents answers were transcribed after the interviews to make the analysis easier.

3.3.2 Selection of respondents

The interviewees were selected with a goal to reach people from both inside the case company and from customer companies. In the case company, the aim was to get access to people with different experiences and views on remote monitoring services to get a broad picture of what the situation with RM services inside the case company is. People from more advanced parts of organisation were selected to get valuable information on their success. Respondents from less advanced parts of organisation were interviewed on the experienced barriers to understand why progress in RM services was not that significant. One person was interviewed from a completely different organisation within the case company in benchmarking purposes: to understand how they had developed RM services to a point where they have large volumes and are very profitable.

Selecting people with different job descriptions e.g. sales and management was done to understand the differences between different roles. It is noteworthy that some respondents had rather broad roles ranging from pre-sales discussions to sales and delivery of the project along with maintaining the service relationship. This made it virtually impossible to label some respondents solely as managers or salespeople. While selecting all interviewees, the researcher was discussing with his colleagues who had better knowledge on which people would be most suitable for this study. The respondents were also asked to come up with possible respondents who had information and opinions on the selected themes. External interviewees were selected with similar principles than interviewees from the case company. Reaching suitable respondents willing to participate proved to be challenging, leading to only two customer interviews within the primary data. Key information on conducted interviews is compiled into table 6 below. The average duration of the interviews was 59 minutes.

Table 6. *Interviewees for primary data*

Company	Interviewee	Method	Role		Job description		
			Specialist	Management	Sales	Maintenance	Service
The case company (CC)	CC1	Face-to-face		x			x
	CC2	Phone		x	x		
	CC3	Face-to-face	x				x
	CC4	Face-to-face	x			x	
	CC5	Face-to-face		x	x		
	CC6	Skype					x
A	A1	Skype	x			x	
B	B1	Phone		x		x	

The interviews were conducted with two different question frames: one for internal respondents and one for customer companies. The questions were designed based on the literature review by the researcher and updated after feedback from the researcher's manager from the case company and the examiner from the university. After constructing the question frame, a test interview was conducted with a colleague to ensure that the question frame is appropriate and that its duration is as planned. As the interviews were semi-structured, the question frame was not always precisely followed but each interview covered the main themes of the frame. The question frames for internal and customer respondents are presented in appendices A and B.

3.3.3 Secondary data

In addition to self-collected data, the researcher had access to secondary data that consisted of notes and archives from discussions and interviews from a project in the case company that had largely similar themes and goals. A noteworthy difference to primary data is that the interviews dealt more with maintenance and maintenance services in general with more limited interest to remote monitoring services. Secondary interviewees were of similar nature than the customers interviewed by the researcher. The secondary interviews were conducted, and the notes were written by people working with service business in the case company. Due to the researcher not being present in the secondary interviews, that data was analysed with increased criticism and consideration. The secondary data was also exclusively qualitative.

Some of the main benefits of using secondary data are that fewer resources are needed in data collection and that it can offer a chance for a comparison to the primary data (Saunders et al. 2009). Its disadvantages, on the other hand, include that it may not be suitable if it is collected to a significantly different study and that data may include interpretations of other researchers leading to false understandings (Saunders et al. 2009). These potential issues to validity require the researcher to assess the data and its sources carefully to see if the data should be included in the study at all. For this study, the data was seen valid as the project in which it was gathered dealt with very similar themes. The companies that were interviewed for the secondary data were partly the same ones that were also targeted for this thesis. The fact that some key personnel were

already interviewed recently advocated to using the previous interview notes as secondary data rather than trying to interview the same people again. As the researcher knew the people involved in the earlier project, he also had opportunities to clarify the ideas behind secondary data documents in case of difficulties in interpretation. Secondary data was also collected very recently, partly overlapping with this study, making the data up to date. All 11 respondents in secondary data worked in either specialist or management positions in their respective companies' maintenance departments. Information on the companies and people that participated in the interviews to gather secondary data is presented below in table 7.

Table 7. *Interviewees for secondary data*

Company	Interview	Interviewee	Role	
			Specialist	Management
C	1	C1	x	
		C2	x	
	2	C3	x	
		C4	x	
		C5		x
		C6		x
D	3	D1		x
E	4	E1		x
		E2		x
		E3	x	
		E4	x	

3.4 Data analysis

After conducting the interviews, the collected data was analysed. During the analysis, most attention was paid to primary data, especially when multiple respondents had given similar comments. Secondary data was mostly used to support the analysis made based on primary data. Statements of the people inside the case company were compared to the statements of the customer respondents and analysis was made considering both groups of respondents. In some cases, such as the needs of the customers, responses of the customers were considered slightly more important than the ones of internal respondents, as the customers are the best possible experts of their service needs. In some other cases, regarding e.g. the current state of RM services, internal respondents were seen as more relevant sources of data.

The data analysis process consisted of four main phases, transcription, initial analysis and coding, drafting the results, further writing and restructuring the results chapter. The process is presented in figure 11 below.

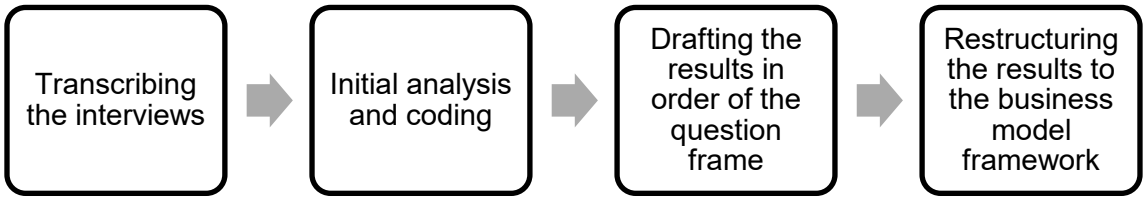

Figure 11. *Data analysis process*

After interviews, the recorded answers were transcribed to word and later added to an Excel file to compare the answers from different interviews. Transcription of the recordings was done in a pragmatic manner: not every single word was written but the transcript consisted of sentences instead of key words to achieve sufficient level of precision without wasting too much resources on writing non-important matters.

Microsoft Excel was used as a tool to help the coding of the data. An Excel sheet was divided into separate main themes each including multiple sections marked with a separate code. For example, collaboration was labelled as theme 4 and section “value co-creation experiences” was labelled with a code 4.1. Answers fitting each code were written next to it, regardless of the question asked before the answer. Themes were designed based on the question frame. Initial analysis of the data and drafts of the results chapter was done mostly following the structure of the interviews as the structure provided a logical sequence starting from introduction to remote monitoring services and then moving deeper to customer needs and the business model of the case company.

After reaching a preliminary version of the results chapter it was reorganised to better answer the research questions and to improve the flow of the text. The results chapter is structured to follow the division of business model into three parts: value creation, value delivery and value capture. Results begin with introduction to the remote monitoring services in the case company and outlook to the RM service market. Then the text moves on to address value creation issues followed by value delivery and capture. After presenting the results in the following chapter, they will be compared to the findings of the literature review in the discussion chapter. The framework proposed at the end of the literature review will then be applied using the material from both theoretical and empirical parts. The contents of the model were constructed based on the more important and frequently mentioned themes in the literature and interviews while considering the context of the case company based on the researcher’s knowledge. The contents were also shown and discussed with the researcher’s supervisor to ensure that they are appropriate.

4. RESULTS

4.1 State of remote monitoring services

4.1.1 Remote monitoring services inside the case company

In this chapter, results based on the data are reported. The internal respondents widely considered the case company as a manufacturer that has services to complement the products. The role of services in the case was seen as a differentiator when product market is commoditised. Overall, role of services in the case company were mentioned to have increased and a respondent highlighted Finland's role as a global frontrunner in service business through the years. Respondents had consensus that the role of services should be bigger than it currently is.

Customer respondents agreed with the case company employees on the case company being primarily a manufacturer. A customer from company A had noticed the service presence had grown during recent years, especially after the customer company started operating a new plant equipped with remote monitoring services from the case company. Another interviewee from company B stated that both parts of the company were significant and almost equal.

Services were seen to complement products without any bigger conflicts between the two businesses. However, some internal respondents thought that an inability to make use of services existed. One interviewee analysed that the possible difficulties of selling services and products are all internal, and not visible to end-customers. Another respondent mentioned that sometimes people are not able to understand the whole lifecycle of the product. Another case company respondent agreed that sometimes salespeople prefer selling products more than service contracts as products tend to be more expensive.

"Only friction between products and services is that it is nicer to sell the more expensive deal even if the cheaper contract was more profitable for the firm."

Room for improvement was found in service management. A case company respondent mentioned that management and development of services was too separate from that of products. This was experienced as barrier to more integrated product-service systems. Another respondent revealed that each business line is responsible for its own services without a common service organisation for the whole company. This was seen to increase the gap between different business lines as strong service organisations get stronger and weaker organisations do not develop at the same pace.

Remote monitoring services were mentioned by the case company respondents to be strategically important for the case company. Multiple respondents however suggested

that the strategic importance might not yet be completely carried out as the human resources on RM services were understood to be very limited. A case company respondent pointed out the difficulty of creating new kind of service business in a big company:

"You don't get resources before you have business, but it is hard to create business without resources".

However, another case company interviewee from a department with more advanced RM services argued that companies should make the decision to actively start growing RM services even though the early stages are likely to be unprofitable:

"Of course, there is a critical mass, but it is also a business decision. If the business decision is not made, then the critical mass will never be achieved. It needs a lot of efforts."

Falling behind ambitious digitalisation goals applies to customer companies as well. Companies like to position themselves as digitally advanced, but reality often does not match the talks. A case company director explains:

"The competition is not against solutions of competitors but customers' willingness to try to create their own solution or to not apply RM services at all."

The case company respondents highlighted a few types of services of the current offering: offering a quick response time to customers faults, connections for remote monitoring and even some predictive maintenance. Multiple case company interviewees explained the offering in three levels with slightly different descriptions. One described the levels as offering quick response times, connecting equipment to a portal from which they can be monitored, and using predictive analysis to estimate equipment lifetime. Another explained the offering levels in connecting equipment to cloud to enable remote monitoring and troubleshooting, offering dashboards to support customer's own analysis, and analysing wear and lifecycle of components. "Benchmark interviewee" from the case company explained their RM service offering levels as reactive, constant monitoring and reporting, and real-time monitoring. One case company respondent offered more a holistic description of the value creations in RM services of the case company in three levels:

"There are three layers where value is created. First layer is that business units approach customers with their own technologies. Second layer is combining the whole technology portfolio of the company to an integrated solution. Third step is combining those to information of customers automation and ERP systems that allows optimisation of production."

From these definitions it can be concluded that the service offering of the case company consists of different service levels that include traditional services and RM services of different levels. These are presented in figure 12. The figure features currently offered services and the aforementioned holistic RM services which are marked with a dotted

line to highlight the fact that they are still more a vision than actual offering. The arrow on top marks the increase in added value as services evolve from traditional to advanced.

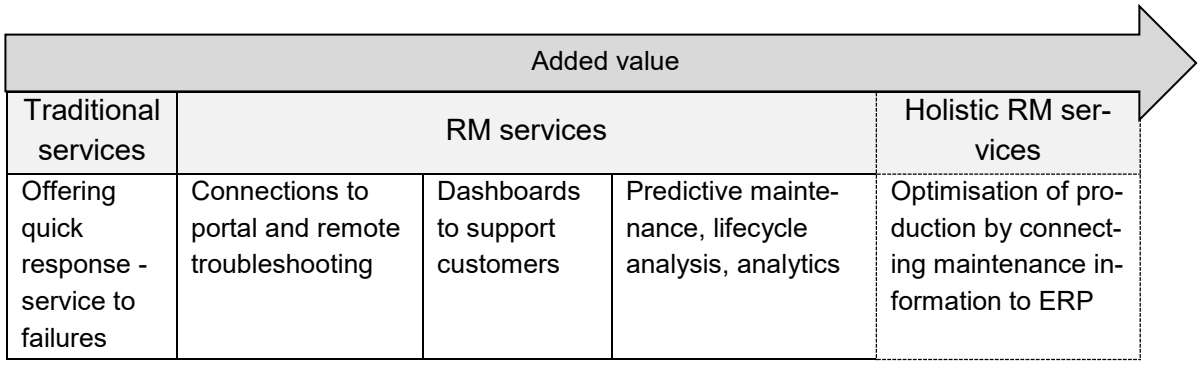

Figure 12. *Offered and envisioned levels of RM services*

On the whole, interviews revealed that different parts of the case company are on different levels in digital services. The amount of services that offer predictive maintenance were still limited but the amount had increased in recent years. The services are not only from independent departments of the case company but also combined expertise of different departments. The part of the case company that this study focuses on is specialised in combining offerings of different business lines as well.

4.1.2 Remote monitoring service market

The results of the interviews confirm that remote monitoring services are in many ways still developing and an immature market. All of the case company respondents assessed that the market for RM services will grow and change in future. Respondents agreed largely that demand for better plant performance and thus services to achieve it exist in customer base. One case company respondent discussed that all services should evidentially contain remote monitoring to achieve more efficient service operations:

"The goal should be that we only have remote services, it is a waste of time to drive around the sites."

The most important types of competitors in remote monitoring services are listed in table 8 below. The table includes competitors' descriptions, strengths and weaknesses identified from the interviews.

Table 8. *Competitors in remote monitoring service market*

Type of competitor	Description	Strengths	Weaknesses
Large OEMs	Companies with product and service offering similar to the case company	Wide portfolio Global presence Amount of resources	Flexibility
Specialised OEMs	OEMs with offerings partially similar to the case company	Ability to focus to a certain market	Expertise limited to certain types of equipment
IT-companies	Suppliers of analytics. Often allied with companies that want to carry out maintenance themselves	IT and analytics capabilities	Dependent on other companies, knowledge on production processes and equipment
Maintenance companies	Companies specialised to offering different types of maintenance	Maintenance expertise, access to sites. Knowledge on customers' processes	Digital competences, knowledge on equipment

Internal respondents agreed largely that the case company had a strong position in the RM service market due to its wide offering and global presence. Only few competitors exist that can answer to the wide product offering of the case company. These companies are also some of the biggest competitors in service business. Many smaller OEMs were mentioned to be strong in narrow segments and with some types of equipment and services but were not able to compete in other segments.

In some cases, the competitors were not other OEMs. Case company respondents reported that some customer companies were not interested in outsourcing maintenance and wanted to carry it out by themselves. This was mentioned to be made possible with partnerships with other companies possessing complementing competences, e.g. IT-companies offering analytics while the customer is responsible for actual maintenance operations. Another identified type of competitors were maintenance companies. They may have good access to the sites and are familiar with the production processes. These companies may however lack digital competences and have less knowledge on equipment than OEMs.

However, industrial plants are large entities and maintenance of such seemed to include many parties. E.g. Company A was running the maintenance of a plant owned by company B while the case company offered its RM services to company B. The respondent B1 mentioned that they do not have the same capabilities to analyse the data as the case company has as an OEM.

Based on the interviews, it seems that remote services with relatively high added value seem to be dominated by OEMs. Different types of companies do not possess capabilities to analyse data from equipment they themselves do not offer. A case company respondent mentioned that the case company can offer some level of lifecycle services to

other OEMs' components too, but it may be difficult to get the needed technical information on competitors' equipment needed to offer all the services. Respondent CC2 pointed out that the OEMs offer different solutions that fit their own technologies but that the field is lacking a comprehensive platform that would support multiple technologies of different manufacturers.

Overall, it can be concluded that the remote monitoring service market is still very scattered. Manufacturers have competitive advantage to offering services to their equipment due to the deeper knowledge on that particular equipment. This combined with the fact of how new and small RM service business still is, has resulted in manufacturers focusing to serve their own installed base first with limited to no offering of services that support equipment of multiple manufacturers. Lack of options has led to the decision being mostly whether to buy RM services at all, rather than choosing between various different service providers.

4.2 Value creation in remote monitoring services

4.2.1 Customers and their differences

Customers were identified to have similar attributes according to interviewees from the case company. As most customers are operating in some sort of process industries their profiles and needs were mentioned to be similar in many ways. A case company respondent pointed out that customer organisations are typically becoming thinner and thinner in terms of manpower and available resources. The respondent explained how this creates a need for supporting the customers:

"Each person has more responsibilities and less time to make decisions. Our job is often to support the decision-making process of the customer".

Scarce resources were also confirmed by the customers. A respondent in secondary data mentioned that they have very limited number of white-collar workers and that the pressure to reduce costs is significant. Another respondent mentioned that an important factor to their maintenance is balancing between the need to keep the plant running and cost pressures.

Also, the increased focus on the life cycle of the product among customers was noticed and identified as a thing that helps the service business of the case company. According to a case company respondent, main differences were mentioned to be mostly about the industries of customers. Industries such as nuclear energy and oil and gas were mentioned to be different mostly due to increased focus on safety issues.

Another differentiating factor between customers was their level in maintenance. A case company respondent explained that some customers are systematically executing predictive maintenance whereas some customers' maintenance consists of fixing equipment when they break down. Some customers were mentioned to wanting to skip the

earlier stages and move straight to much more advanced maintenance. Differences of this size have an effect on what type of services the customer is really ready to adopt.

Of the interviewed companies, company A interviewee reported that they are quite advanced in their maintenance. Company A is using RM services from the case company, has remote connections for several hundreds of devices and is already using predictive maintenance for most critical equipment. Predictive maintenance is relatively new for company A, but they already have successful examples on using data to avoid equipment failures.

Company B is not doing their maintenance itself but using company A (of which company B owns a large part) to do it. Therefore, its level of maintenance is largely tied to company A. Due to the arrangement, maintenance perspective of B is more strategic than operational, i.e. they are more concerned of the results than how the maintenance is organised and.

Company C respondents described that their maintenance is has some remote elements (connections to electric drives) but it is very much carried out traditionally, e.g. vibration levels of motors are followed manually. They revealed to have some challenges in their maintenance e.g. in data management and having relatively low number of white-collar workers to carry out their responsibilities. Also, the equipment that they are responsible for was mentioned to be somewhat aged, making the maintenance more challenging.

Company D had some predictability in terms of asset lifetime, but they did not have accurate predictability for upcoming failures. They described their technical expertise good but reported to have a lot of ad-hoc work in maintenance.

Company E reported that they are measuring some metrics such as vibration levels of bigger machines, but that maintenance is largely based on experience, views of employees and OEM recommendation periods instead of the collected data. They also reported to have some intelligent maintenance applications coming up, but that current maintenance is still mostly traditional.

4.2.2 Sources of customer value in remote monitoring services

One research question of this study dealt with the real customer needs of remote monitoring services and it was thus one of the main themes of the interviews. Respondents identified a few features and attributes that bring value but were ultimately unanimous that providing high productivity for low enough costs is the most important need by the customers.

Many interviewees mentioned the need to keep the production uninterrupted. A company A Respondent named it the most important goal in their maintenance work. High utilisation of assets was also mentioned by an interviewee from company B. That is hardly a surprise as all of the interviewed customers work in process industries where production

is constant and shutting and re-starting the production is slow and expensive as it leads to significant lost production.

Several factors that increased the customers' need for remote services and made selling easier were identified in interviews. All of those factors either made the maintenance and repair work difficult and time-consuming or made it expensive to prepare to failures with a backup asset. Criticality of the equipment was mentioned very often in interviews by different respondents. Protecting equipment that cause the whole process to stop in case of a failure was seen important. Most customers reported that they had done criticality classifications to their equipment already. These companies had different maintenance plans for different criticality classes. Some had a duplicated the most crucial devices or backup devices available instantly in the case of a failure. Other mentioned factors that help service sales include large size of the asset, as such asset are more difficult and expensive to replace. Difficult places such as mines or offshore locations were also seen to accelerate remote services as those locations are hard to reach. Also, cyclical load leading to higher failure rates was understood to create a higher service need.

Safety was reported to be considered a high priority among the customers. Customer companies followed safety metrics for people, environment and process. Despite being a common interest for all respondents, safety aspects were mentioned to be especially important for industries such as nuclear and petrol. Although RM services are mostly used for operational benefits, the decreased the need for physical on-site visits and travelling may improve safety by cutting out parts that contain increased risks. Applying remote monitoring would thus help the case company as well. The focus on operative aspects was also seen in the responses: no company directly mentioned that they are seeking safety improvements from remote monitoring even though all companies mentioned that they are working hard to improve safety. In other words, need for safety improvements existed but customers did not think remote monitoring as a solution for that need. However, the idea of RM services contributing to better safety was presented in interviews with the case company employees.

As mentioned above, customers' organisations were identified to have low internal personnel resources. Customer companies also do not have the same expertise considering specific products than OEMs. The greatest need for expertise of the case company seemed to be divided for fault situations and analysing the data for optimisation purposes. Faults in critical equipment can possibly cause the production process to stop making each minute of waiting expensive and fixing the problem important. Even if the customer could find a solution independently, using the service is a good option if it leads to solving the problem quicker. Another typical case where access to expertise is needed is analysing the collected data from remote monitoring. Customers reported that in these cases, the manufacturer of the device typically has the best competences to understand the data and deliver more value than customer company could do alone.

It was found out that some customers think whether they need their own resources or if they can be outsourced. Remote monitoring was mentioned to enable the centralisation of experts into one remote centre that can serve multiple locations. Another mentioned

benefit was that outsourcing the monitoring released the customer companies from having to keep up with all different versions of each device inside the factory. A case company director explains:

"If you consider a centralised remote monitoring system where people or a system can monitor multiple systems at the same time. It is much more efficient than a single plant maintaining the expertise and resources only for their own assets. Furthermore, every revision provided by OEMs are different, making the revision control of a factory very difficult. A factory-like party that organises its own maintenance has limited chances of keeping up with all the revisions."

As mentioned briefly in chapter 4.1.2, the need for external resources was not only linked to the small number of employees in customer companies, but to the case company's superior understanding of the equipment it has manufactured. As a single plant has many different devices from different suppliers, plant operators do not typically see it useful to have all the possible knowledge of all those devices, but rather buys the analysis from the supplier. Respondent from company B mentioned that the complex technology especially in automation and electrical maintenance and having the required expertise is one of the main challenges in their maintenance.

One clear theme that was present in all customer interviews was that they all were operating under strict cost pressures. Even though ensuring that the operations were uninterrupted and efficient seemed to be the main goal of customer companies, there maintenance decisions were guided by financial boundaries. In practice this resulted in reluctance to invest in new types of activities if the results seemed uncertain.

Overall, customers seemed to strive for positive customer value in their service contracts. Yet this was pursued rather by reducing costs than increasing the received benefits. Goal of maintenance was seen to keep the operations running with affordable costs. Respondent from company B listed cost-efficiency in one of their top-2 goals and efficient allocation of scarce maintenance budget as one of the main challenges in their maintenance. A case company respondent highlighted their idea of how maintenance is typically understood in process industries:

"Considering digitality and remote monitoring, if it can create better and more accurate results with same or lower costs, customers will choose it immediately. If customers need to invest more in order to get better results, then some customers will select it. From maintenance point-of-view, many customers will have to settle to traditional maintenance because there is no better alternative available for them."

Respondent from the case company added that in addition to savings, key value that service provider delivers is financial predictability by offering lifecycle-services. That respondent also identified keeping up with the promised budgets as one of the strengths of the case company that provide transparency and predictability.

Financial metrics were mentioned to be used by customers when considering new service contracts. A respondent from company C mentioned that they seek payback times of 2-3 years for their maintenance investments in general and that they follow the internal rate of return of the investments. Previous investments were mentioned to be mostly for purposes of improving energy-efficiency in company C and other customer companies as well.

Avoiding unnecessary shutdowns was found to be the main driver for the time frame of predictability. Respondent from company A mentioned that the sufficient length for predictability is 18 months as that is the time interval between the plant's maintenance shutdowns. It is better to replace the device during the shutdown if the maintenance team knows that a device will most likely fail before the next shutdown and that the failure would cause the process to go down. However, not all devices are equally critical to the process and it was mentioned to be typical to do maintenance between shutdowns whenever possible and needed. Company A respondent's comments on the time frame of predictability were confirmed by a respondent from company B with almost identical answers. Case company interviewees also named the maintenance shutdowns critical for doing major maintenance work. To summarise the main results, different identified service needs expressed by each participating customer company are presented in table 9 below.

Table 9. *Needs expressed by the participant companies*

Need / Company	Asset productivity	Cost efficiency	Access to expertise	Predictability	Safety	Risk management
A	x	x	x	x		
B	x	x	x	x		x
C	x	x	x	x	x	
D	x	x	x	x	x	
E	x	x			x	

Productivity and cost efficiency seem to be the most important service needs as they were mentioned by all of the participant companies. Some of the needs are however linked: predictability can help companies to achieve both higher output and reducing costs. Access to expertise is used to achieve different types of benefits. These needs where however explicitly expressed separately and are therefore also presented separately in the table despite being interlinked. It is also noteworthy, that the findings are based on the collected data and may thus not be completely accurate: an empty cell does not mean that the need does not exist in the company, even if it was not mentioned in the interview.

4.2.3 Barriers of the remote monitoring services

The respondents from both the case company and customer organisations also mentioned some downsides of the case company RM services and sacrifices (other than monetary payment) the customer has to make in order to start using the services. The

sacrifices mentioned most often by the case company respondents were increased complexity to the system by new devices and processes caused by the new service. The system needs to be set up, requires suitable connections and communications and calls for new kind of thinking in maintenance to be fully utilised. In terms of other sacrifices, a case company respondent mentioned that relying into services will make the customers dependent on the supplier and may limit their future options. Another case company respondent estimated that new kind of service creates questions and possibly ambiguity on the division of responsibilities. Technical challenges were also mentioned, as customers may not trust the reliability and accuracy of the service enough. The reliability issues were acknowledged by the case company personnel as well as a respondent mentioned that customers are very sceptical to try new types of services unless the reliability of the system has been proved to customer. The user interface was also seen as a place with room for improvement: Customer from company A mentioned that it would be better if there was an online view available at all times. This view should be available with mobile devices too.

The customers were happy about the services in general but mentioned that the services have been in early stage leading to some technical difficulties. Respondent from company B stated that the service was not ready in the beginning, but that it is trustworthy now that the faults have been fixed. Respondent from company A agreed with case company interviewees on the added complexity brought by adding new services.

It was mentioned to be sometimes difficult to reach the correct people within the case company. A company C respondent mentioned a case that waited three weeks for resolution. The customer did not receive any notification that the issue was being managed which caused uncertainty in the customer. A case company Interviewee addressed the issue by mentioning that their department had experienced positive customer satisfaction by offering constant 24/7 support and letting customer know that someone is helping them. A case company respondent identified that the case company is prone to silo behaviour and gaps in communication caused by it.

Difficulties in establishing remote connections was seen as another impeding factor for the case company's RM services. A case company respondent described the establishing the connection for RM services:

"At the moment establishing the connection needs quite a lot of expertise even though it is just connecting one box to the frequency converter."

A case company respondent mentioned that for some types of devices, establishing the connection may be more expensive than the acquisition price of those devices. That makes it difficult to argue the value for customer even though the annual price of the connection would be affordable. For longer contracts, the establishing costs could be divided between several years to make it look smaller. However, most customers were mentioned to have low to none experience on remote monitoring services and thus be reluctant to commit to longer relationships before knowing that the service is worth the

investment. The added difficulty from high set up costs was also mentioned by respondent from the case company, who added that their department has already achieved such a scale in their business that they can afford the set up to pay back after few years rather than instantly. It was also revealed that it was cheaper and easier to add connections to new plants compared to adding them to existing plants.

Despite some negative feedback, customers considered the case company to be customer oriented. Respondent from company A felt that the case company is customer oriented and that the collaboration spirit between the companies had been good. Respondent from company B also considered the case company as a customer-oriented company

4.2.4 Benefits of the service provider

In addition to providing value for customers, the supplier aims to create value for itself too through the service contracts. Other than the increased revenues, differentiation from competitors was one of the most frequently mentioned benefits to the case company. Offering remote monitoring services was also seen as a tool to improve customer relations and to create commitment among customers. With the help of good relations and committed customers, the case company is able to get more contract-based business instead of having to strive for new sales transactions over and over again. Contract-based business was also mentioned to help companies to predict their future cash flows and thus reduce the uncertainty of the business.

Once the service provider has achieved larger scale, RM services can be used to achieve cost efficiencies. The need for visiting sides is reduced when troubleshooting can be done remotely, and the experts can perhaps remotely advice the personnel on site to be able to take care of the issue themselves. Especially when the destination is difficult to reach the savings in both time and money may be significant. When the need for travelling – especially flying – is decreased, benefits are also ecological, which can in turn be used for marketing purposes.

The idea of using the collected data for organisational learning was also taken into account in the interviews to small extent. Some case company respondents mentioned using the data to support own research and development. However, it was also mentioned that many customers are strict about owning all the data collected from their equipment. Respondent from company B stated that the data from the equipment sold by the service provider could be used to analyse how the equipment are operated even if that led to the service provider offering consultative services to its competitors as well. Data regarding the production process on the other hand, was not permitted for further use than necessary.

4.2.5 Value propositions for remote monitoring services

Value propositions of the case company were usually related to offering services to the equipment that was experienced to be critical for the customer, as mentioned earlier in

chapter 4.2.2 when discussing the customer needs. Another factor the case company pursued with its value propositions was the aim for creating lasting customer relations. A case company respondent highlighted the ability to work with the customers to find out where the value can be found and then create services to achieve a mutually beneficial contract. Another source of value was combining the parts of different offering of the case company to create a more complete package.

Despite having ideas on what the customers consider valuable, the interviewees did not report on much research about customer needs. Data was mostly mentioned to be collected from talks with customers along with some workshops, which had recently been arranged increasingly.

According to the case company respondents, understanding of value and the operations of customers were used to present customers some calculations of how much value the offered solutions can create. Most respondents mentioned that they had created some calculations on services. Quantifications were even considered a necessity for a concept to be ready for sales according to one case company interviewee:

"In order to have a sellable concept, one must have specific assessment of how it will bring value to each side (producer and customer). If a business unit cannot answer that question, the concept is not ready for sales."

However, some respondents thought that creating trustworthy calculations was difficult. A case company respondent explained that it can be difficult to point out why some breaks happen and especially why they are avoided. Even though case company equipment e.g. motors and electric drives are often critical to the process, there are also other assets that may affect the outcome. The respondent also mentioned that it is possible, that in some cases the algorithms recommend doing more maintenance than before. In those cases, maintenance operations may require more resources, but possibly avoided losses and failures can create benefits. It was also mentioned that due to the novelty of the service, it is yet difficult to create calculations based on experiences.

Customers agreed that it would be difficult to provide accurate calculations. Customer from company A felt that it would be hard to measure the effects of a certain service on total plant productivity since there are so many factors that affect it and the case company's installed base represents only a minor part of the total equipment in the factory. Respondent from company B highlighted that calculations require many assumptions that change its outcome and felt that they as plant owner have the best knowledge on different cost and benefits that maintenance can bring.

4.3 Value delivery in remote monitoring services

4.3.1 Collaboration experiences and ideas

Many respondents of both the case company and customer companies had experiences on collaborative value creation and partnerships and considered collaboration as a positive phenomenon. Experiences on collaboration were often related to development of services and products. A case company interviewee mentioned that collaboration was more typical in large capex projects, e.g. building a new plant, while collaboration in services was typically less advanced, but more like tailoring according to customer's wishes. A case company respondent highlighted that collaboration in service relationship is often operational. Personnel on customer's site and supplier's monitoring centre may work together in order to solve problems at the customer's site. On more general level, a case company interviewee analysed that the key to success in collaboration was having "mutual thoughts and opinions". Another case company respondent saw that it may become indistinct who the real value creator is, in a network of actors, where the case company provides its services to another service provider that uses the service in to create value for the end customer.

Collaboration was also associated to educating customers on the possibilities brought by digitalisation. If customers are not sure what digitalisation could mean for them, the capability to propose suitable solutions can create good business opportunities and lead to collaborative design of solutions. A case company respondent highlighted the supplier's ability to find the spots where value can be created, get the access to provide that value and reach a position as a partner rather than a supplier. Collaboration was mostly related to long projects and a case company respondent saw the value of collaboration to be better if collaboration was done for longer times:

"I think that is the power of collaboration, when we work together from the start."

The case company has knowledge on e.g. which of its products best fit the customer's needs and thus offer the best results for suitable costs. Due to longer relationships, interviewee from the case company mentioned that collaborative practices call for deciding the supplier earlier and can make the comparison of suppliers more difficult for the procurement departments of customers. This creates a potential conflict between collaboration and the traditional ways of how procurement is done.

Customers felt that their collaboration with the case company had been good and that their wishes had been mostly fulfilled. Level of the collaboration reported by customers was however not especially advanced as experiences in collaboration were mostly limited to offering ideas for development. Respondent from company A mentioned that they have similar collaboration experiences with plenty of other companies operating in similar industries as well. That respondent also mentioned that it could be possible to take advices from the case company in order to improve their processes if that type of service were available.

4.3.2 Resources and capabilities needed in remote monitoring services

The interviewees came up with many different skills and capabilities that are needed especially when offering remote monitoring services. Two of the most frequently mentioned were new types of sales competences along with understanding customers operations and viewpoint. Other mentioned themes include understanding of IT and the products of the case company, life cycle management and risk management. Customer orientation and understanding their business is not necessarily new compared to other service business, but as advanced services tend to bring the supplier and customer closer, also the understanding must be deeper.

Increasing need to IT-capabilities was related to growing amounts of collected data, that need to be managed and analysed properly to create value. In the case of data analysis, the two previously mentioned competences are connected. In addition to IT-skills, the analyst should also have some knowledge on the application of which the data is collected.

Risk management was associated to advanced earning logics that lead to service providers assuming the risks for a larger compensation. When a company has a large number of contracts in its portfolio, it can better manage the risks of individual contracts.

A case company respondent also highlighted that when communication is more and more carried out remotely, it becomes important to communicate in a concise way, delivering all the necessary information in one message so that it can be understood by less skilled people too. Knowledge on internal matters was also mentioned to be needed, when selling combinations of products from different business units. Internal connections across the firm are needed to understand the offering and how they could be connected to create services with greater value.

As mentioned previously, selling RM services was one of the themes most mentioned to need capabilities. Respondents agreed largely that selling RM services was different when compared to selling traditional services or products. A case company respondent stated that selling RM services was more abstract and that value should be made more concrete to the customer to sell them. Creating trust was also considered important as the benefits of the service may be different to prove to customer.

A case company respondent pointed out that it is more difficult to try to achieve good results by selling less now by only replacing equipment that really need it. Yet in that way value of the relationship can be increased in long term. The respondent mentioned also that even though offering RM services requires more capabilities, it also offers the supplier a chance to develop itself, helping to grow its business. On the other hand, another case company interviewee argued that selling the services was not really more difficult, although different. According to him using and presenting the customer view was not more difficult than using a website. The interviewee stressed that the issue was mostly mental and that many people were too cautious to sell them.

Hesitation to sell RM services was mentioned by other case company interviewees too. An interviewee mentioned that salespeople were often hesitant of offering new service products to their customers, as they themselves were not confident with the service. That lead to fear of weakening the customer relationships that have been profitable in the past. Another interviewee mentioned that some salespeople are not familiar enough with RM services and therefore are not willing to promote them as actively as they should.

Respondents also shared their opinions, on how should the communication in service relationship be managed to best deliver value to the customers. Interviewee from company A said that it would be better to have access to an online dashboard all the time with different devices and that having daily, weekly or monthly reports was not so important.

On the other hand, a case company respondent mentioned that based on their experience customers preferred an active approach over making the information available passively. Another case company respondent also mentioned that constant reporting and reacting quick has been a good policy for them and that their customers appreciate just receiving a notification that someone is soon taking care of their issues. Similar comments were expressed by the company C, which had previously had negative experiences in reaching the correct people in the case company.

4.4 Value capture in remote monitoring services

Pricing methods were among the most discussed things in the interviews about capturing value. It was mentioned to be mostly carried out with traditional methods. Remote monitoring service contracts were mentioned to include different subsystems: founding the system, continuous monitoring and possible maintenance activities were mentioned most often. These were also mentioned to be billed separately.

Pricing was widely reported to be a mix of time-based and transactional by the case company respondents. Case company could offer a certain service level with fixed monthly or annual pricing, but certain maintenance activities were charged based on how much time and resources were used each time. Prices for each billed hour were in turn mentioned be often based on costs for the case company rather than the value delivered by the service. Setting up the system was also mentioned to be often charged separately as it is significantly more expensive than just maintaining the monitoring system. It was also mentioned to be possible to divide that payment to be paid in few years with the cost of monitoring.

Overall, pricing of the advanced services seemed to be a bit unclear. As these services are relatively new additions to the case company´s offering, best practices have not yet been completely discovered. Also advanced pricing methods were not widely applied but rather experimented on some occasions.

The level of pricing was not experienced to be too high according to the customer interviewees. Respondent from company A pointed out that the services help the plant to perform well and therefore did not feel that it was too expensive. A company B respondent concluded that the prices must be reasonable compared to the received value since the contract has not been cancelled. However, a case company respondent thought that the case company is possibly selling its services for too low prices in order to just get some sales:

"A great risk is that services are sold for too cheap. The productivity leap to customer is so great that services should be sold with a large price. But if the customer cannot recognise the benefit, they will not buy it. It is always easier to determine the price based on costs rather than value, but it includes the danger of selling for too cheap."

The comment further highlights the importance of communicating value and convincing the customer of the solutions' potential. There was some ambiguity on how much the services cost to the customers. Customer respondent from company A pointed out that understanding the total costs of different service agreements can be hard sometimes, as they are all billed separately, leading to many different contracts and payments.

Even though pricing was mostly carried out with traditional methods, there were some ideas and even some experiments of using other methods as well. A company A respondent mentioned that in the early stage, an "all-inclusive" contract might be more natural choice for the customer organisation, but that later they could prefer shift to a contract with payment based on performed maintenance activities. The view again underlines the customers willingness to avoid taking risks with a new solution, with an idea of returning to traditional way later. A case company respondent mentioned that the demand for all-inclusive type of service contracts had existed for quite a long time already, but that OEM's are generally hesitant to offer those types of contracts and thus assume those risks that come with it. Another case company respondent linked the pricing mechanisms to how well the case is known by the service provider:

"If one understands the entity and the external factors that affect the results, then one may use pricing based on performance"

The respondent added that due to some previous failures the case company had become more risk aversive and thus less eager to applying advanced pricing mechanisms to service contracts. The respondent also called for a more experimental culture in earning logics where ideas could be tested and possibly scaled more quickly than is possible now.

Outcome-based contracts were received with hesitation. A company A interviewee pointed out that many different things affect the plant´s performance making it difficult to assess the impact of each actor. The interviewee was however positive towards the idea if correct metrics could be developed but that without accurate knowledge it would be difficult to use more advanced methods such as value-in-use pricing. Respondent from

company A also revealed that they have an outcome-based contract with company B, to whom they in turn deliver services.

Interviewee from company B mentioned that the contract could include some type of bonuses or sanctions depending on the performance. However, the interviewee was sceptical of value sharing and connecting the bonuses to achieved benefits as it was feared that the bonuses could become too large and called for a contract model where risks were not too significant for the customer.

The benchmark interviewee from the case company mentioned that they had experimented some different earning logics. The pricing their department was using was mentioned to be mostly a mixture of cost-based and value-based pricing. However, they had a policy of offering the first year of service for free with the idea of first proving the value to customers and then later keeping them as paying customers. That was reported to have worked well for them. However, the respondent mentioned that offering connections for free previously had not been a good decision and that connections itself should be charged. Their department also had some ideas and experimentations on new earning logics. One concept was mentioned to include 20% of price based on performance that would be returned if performance was not as promised. Another concept was the idea of offering some machinery for free, but sharing the savings in i.e. energy efficiency equally, leading to potentially large opportunity for the supplier.

Some other interviewees also had some experiences on more advances pricing methods. A respondent mentioned that they had applied value sharing in some energy efficiency cases and another mentioned having some experiences on cases where the case company had piloted some risk-transferring.

A case company respondent mentioned that the company policy in packaging products from different units and selling them through a country organisation makes it more difficult to use more creative pricing mechanisms as the product units will have to be paid internally based on how much of their products is needed, which can make using e.g. fixed prices more complicated. It was also mentioned that as the newest services are not completely ready and productised yet, it is more difficult to create a more creative earning logic. Problems were seen in e.g. determining on how to decide on replacing some parts when customer’s opinion is different from the recommendation of the algorithm’s and how should customer be charged in those situations.

Despite not yet using advanced earning logics to capture value from services, the expectations for profitability from the case company’s upper management was mentioned to be high. That was reported to create a need to develop services in order to advance higher profitability.

5. DISCUSSION

5.1 Needs of the customers

The first research question was formulated in following way:

RQ1: What are the key customer needs for a remote monitoring service?

The main customer needs found in the empirical part were first presented in table 9 in chapter 4.2.2. The most important needs were improving asset productivity, reducing maintenance costs, getting access to supplier's expertise, adding predictability to maintenance and safety improvements. Risk management was also mentioned by one of the participant companies. Findings on benefits of remote monitoring services from the literature were in turn analysed in chapter 2.2.2.

The results of the empirical part revealed that main customer needs were to get effective maintenance that provides high utilisation and good productivity with as low resources as possible. These results are consistent with the findings from the literature: productivity and operational efficiency are mentioned repeatedly in the literature as well (Grubic 2014; Jonsson et al. 2008; Löfberg and Åkesson 2018). Even though operational benefits were listed as the main customer need and benefit in both the literature and empirical part, there were still some differences in approaching the subject. In the articles, the issue was approached perhaps more comprehensively describing different components that lead to decreased productivity such as undetected and unreported errors and language problems (Jonsson et al. 2008). Customers on the other hand were simply focused on the end result: how the plant is running and how much is it producing.

A notable finding is that literature paid relatively little attention to the cost pressures maintenance people have on them. Respondents reported relatively high availability on their assets already. There were mentions of a need to further improve it and to get more production from the plant, but most customers already had their productivity on a relatively high level. Cost pressures, however, were high in all cases hinting that in some cases benefits of the RM services could be more related to reducing costs than increasing the output. It is notable that costs, (primarily from production processes but also maintenance costs) are linked closely to the productivity of the assets. Even so, they are mentioned separately here because the importance of reducing costs was mentioned so explicitly on various occasions.

The literature focuses heavily on customer value issues and scholars like to see things from the value point-of-view (e.g. Grubic and Peppard, 2015). There are mentions of successful cases with cost reductions (Hasselblatt et al. 2018) but even in those the focus is mostly in delivering value and not so much on cost savings. It seems that customers are still a little bit behind scholars with their approaches as they reportedly focus

a lot to the cost of service. Lack of research with customer data was earlier identified as a research gap in chapter 2.5.1. Better understanding customers' priorities and acknowledging focus on costs can prove to be useful when proposing new service offerings. Similar thoughts on better understanding customer's context of adopting services and decision-making to foster service sales have been reported in the literature (Vaittinen and Martinsuo 2019).

Choosing especially maintenance people for interviews may partly explain the focus on costs in the results as maintenance can be seen as a function that does not create value like production but rather makes value creation possible. It could be also, that the customers focus heavily on costs because delivered value of the services is not significant enough. However, customers reported that they were generally satisfied with the services. The current prices were not considered too high by the customer respondents either. That is of course a somewhat biased group as they have agreed to buy the service, unlike some other potential customers of the case company that were not interviewed for this study.

The fact that cost pressure seemed to guide decision-making in many customer companies and customers were focused on reaching positive monetary value on their contracts hints that providing companies should focus in their value propositions and value proving to convince customers that the delivered value exceeds the required sacrifices. Importance of value propositions in industrial service business is backed by the findings from literature (Klein et al. 2018; Dijkman et al. 2015; Löfberg and Åkesson 2018; Grubic 2014). However, offering quantifications of the provided value was not seen important by some of the customer respondents. Customers claimed to know the price tags caused by lost production and told that it is hard to assess the effect of a single supplier in a network of actors. That lead to suspicion regarding a service provider's ability to provide reliable calculations. There were however mentions of metrics such as payback times and internal rate of return being used by customer companies. Experiences were best in energy efficiency matters where it is possibly easier to create calculations and measure results. Even though customers were even more focused on reducing costs than creating new value it does not automatically mean that the case company should focus similarly to reducing costs but perhaps convince the customers that they should also change their approaches to be more based on value. Another factor that could lead to better mutual understanding is collaboration. Creating value propositions together with customers, highlighted by Sjödin et al. (2020), could be a way to make customers more value-aware.

Costs are not the only mentioned value driver that can be linked to others. Predictability creates visibility that helps companies to plan their operations and to reach their maintenance goals. The expertise of partners can in turn be used to almost anything. Predictability and accessing service providers' expertise may be mostly tools that are used to achieve the maintenance goals and are thus subordinate to goals with intrinsic value such as productivity and safety. There is a possibility of multiple different factors being linked: a supplier's expertise can be used to create a solution that enables predictability leading to higher productivity, lower maintenance costs and improved safety. Yet the

different factors were mentioned as separately so repeatedly that they are recognised as separate customer needs in this thesis.

As mentioned earlier, access to expertise of the supplier, adding predictability to the maintenance and safety improvements were also repeatedly mentioned as customer needs in the empirical part. The customers admitted that they do not have the resources nor the expertise to always understand and analyse the product data in cases of failures or optimisation. Even though lack of customers' resources was recognised by both internal and external respondents, the references in literature are scarce.

Even though the service already enabled some predictability, customers had a need for more. The customers mostly agreed that they had a lot of data but that the data was not put to good enough use. More advanced analytics were needed to help customers achieve their maintenance goals. This resonates with the idea that monitoring and collecting data itself does not add much value to the customers (Oliva and Kallenberg 2003). Contradictory, it was also mentioned that it had been a strength for the remote monitoring services of the case company in marine industry, that the customer had access to original data in addition to the provided insights. Similar thoughts of creating possibilities of learning by giving access to data were also expressed by Jonsson et al. (2008). These findings imply that providing analysis is the most important thing, but that raw data should also be offered if the customers want to have it for validation or learning purposes.

The need for improved safety was recognised mostly by customers from the secondary data. Recognising the slightly different question frames could hint that even though safety is monitored closely and considered important, remote monitoring services are not considered as a way to achieve those benefits. This suggests that service providers should highlight the potential for safety improvements such as reduced need for travelling and on-site operations especially in distant and hazardous locations (Porter and Heppelmann 2014; Meier et al. 2010) in their value propositions.

Transferring risks from the customers to suppliers was mentioned as a customer benefit of RM services in the literature (Grubic 2018), but not very much in the interviews. Managing risks is especially connected to outcome-oriented earning logics (Visnjic et al. 2017). Lack of experience from such earning logics may explain why managing risks was not considered as a potential source of value from RM services by the customers. Should the case company experiment with outcome-oriented earning logics, the factors related to risk transferring should be both understood internally and communicated to customers. It is also notable that the customer benefits from managed risk were not only related to production outputs but also to e.g. risk of losing key personnel (Grubic 2018) linking it to previously discovered benefit of "access to expertise".

5.2 Business model to remote monitoring services

The second main objective was to develop the business model of the case company. The second research question was defined in a following way:

RQ2: Through what kind of business model can the firm offer remote monitoring services that fulfil the needs of the customer?

A conceptual framework was proposed and presented in chapter 2.5.2 to help structuring suggestions for business model improvement so that it would be more fit for the special case of remote monitoring services. In this chapter, the ideas for a suitable business model will be presented and discussed according to the structure of the framework. Based on the findings, suggestions for improvement will be presented in conclusions. The framework with suggested contents is presented below in figure 13.

Key Partners	**Capabilities and processes**	**Value propositions**	**Value co-creation**	**Customers and their needs**
It-companies Maintenance companies	Understanding customers' processes Sales capabilities Technological capabilities and analytics	Targeting critical components of processes Building positive mindsets in sales Develop more reliable quantifications of value Trial periods	Service and value proposition co-development Shift to more open ecosystem and increased visibility Internal collaboration	Maximizing productivity Cost efficient solution
Captured value of the service provider Cost efficiently scalable and customisable services Economies of scale and scope Value-based and usage-oriented earning logics Non-monetary benefits e.g. creating business from data and brand benefits				

Figure 13. *Proposed business model components*

First block of the framework is "Key partners". The importance of networks in value creation was frequently mentioned in the literature (Kindström 2010; Rönnberg Sjödin et al. 2016; Leminen et al. 2018). Partners in remote monitoring services may include such as service operators responsible for on-site work or it-companies providing capabilities to data-analysis, algorithm creation or cloud computing (Hakanen et al. 2017). Operating in RM service market may be difficult as some of the possible partners may also be working with competitors or even be competitors themselves as seen from the table 8 in chapter 4.1.2.

The second block was named as "Capabilities and processes". Findings of the empirical part and literature review on the most important capabilities in the era of RM services are

mostly consistent with each other. Ideas were mostly similar in literature review and empirical part with some differences. Findings suggest that three capabilities arise over the others. Firstly, companies should be able to understand the business of the customer to be able to understand where the most value can be created. Secondly, new types of competences are also needed to convince the customers to purchase the service as they may not yet have experience on those. Selling RM services was mentioned by the case company respondents to be different but necessarily more difficult compared to other services. Thirdly, technical competences are required in order to deliver services with high added value efficiently. Customers reported to already have data but creating valuable insights from it remains a challenge.

Other mentioned capabilities include both more individual (understanding own offering), organisational (managing ecosystems, cost efficiency platforms and agile development) and capabilities combining both (life cycle and risk management). Findings of this study are more related to individuals whereas literature focuses more on organisational level (Rönnberg Sjödin et al. 2016; Hasselblatt et al. 2018). Interviewees may have reflected the competences needed in their own work and have thus come up with such capabilities. Findings from chapters 2.4.2 and 4.3.2 are combined below in table 10.

Table 10. *Comparing capabilities for remote monitoring services*

Remote monitoring service capabilities	
Literature	**Empirical part**
Understanding larger customer systems and processes	Understanding customer operations
New selling capabilities	Sales competences
Technological infrastructure and capabilities	It-competences
Managing ecosystem of partners, relationships and collaboration	Knowledge on the case company offering
Cost efficient scaling and customisation	Life cycle management
Building a solution platform	Risk management
Agile creation of new services and business models	

Third block, “Value proposition”, was mentioned to be the most important part of business model in literature (Dijkman et al. 2015). As value propositions should be concise and focused to only few key points (Anderson et al. 2006) the supplier should include only the factors that bring most value for customers. For RM services especially, a common problem was that value propositions are expanded too much making them ambiguous (Porter and Heppelmann 2015). Findings revealed that customers are most focused on increasing the productivity of their assets and reducing maintenance costs. It was also revealed that the case company had especially good experiences when offering remote services to assets that are critical for the customer’s process and situated in challenging locations. It seems that combining these findings could lead to good and concise value propositions.

It was also disclosed that there had been challenges in offering the RM services in the first place. Issue was linked to salespeople not being familiar enough with RM services to offer them confidently, ambiguity in technological choices and unfinished solution. Familiarity of the salespeople to RM services should be ensured to confidently offer them. RM services should be seen as a managerial challenge rather than a technical one (Allmendinger and Lombreglia 2005). That means focusing on the business value of the solution rather than which particular technology is used for the connection. Service products' unfinished state was mentioned to be another factor that lead to hesitancy to offer solutions and customers being impatient for a more mature solution. It is understandable that a solution with limited customer base and history in quickly evolving industry is still under development. There should be clear communication whether the solution is a pilot, more proven concept or a ready product to reduce unclarity on both sides.

Offering calculations on the value was considered complicated and was not yet widely seen as a way to convince customers. This finding is consistent with the literature (Grubic and Peppard 2015). However, if the earning logic is to shift towards selling value, availability or outcome, calculations are needed to determine how value is shared and how much can the supplier charge for its service (Sjödin et al. 2020). If the ability to estimate value can be developed to a level that supports value-based pricing, then it should also enable offering more convincing calculations to create better value propositions. If calculations are not seen convincing by the customers, the challenge of value proving could also be overcome by offering free trial periods as already experimented by the case company's marine business.

Fourth block of the framework was named as "Value co-creation". It was discovered in the literature review that collaboration and value co-creation are closely related to remote monitoring services (Reim et al. 2015). It has even been argued that increasing resource integration between the supplier and the customer would lead to better performance (Löfberg and Åkesson 2018).The respondents from the case company and customer companies had a positive approach to collaboration and partnerships. However, ideas of partnerships, collaboration and value co-creation seemed relatively difficult for many interviewees, even though some explanation of what was meant with it was offered during the interviews. That may explain partly, why some answers were indistinct and lacked concrete product. The results indicate that collaboration may not yet be as advanced as in visions where value co-creation process is seen as a requirement in capturing value from remote monitoring (Grubic and Peppard 2015; Reim et al. 2015).

The case company already has experience on arranging workshops with the customers. This is seen as a good way to increase collaboration, understand customer needs and develop services and the business model to be more customer oriented. Other reports on collaboration were often related to single projects or providing feedback for improvement. The experiences seemed isolated and unique and not really integrated into the business model of the case company. In literature, there are examples of cases where collaboration is on a more institutional level such as "system of systems" (Porter and Heppelmann 2014) where PSSs of multiple parties coexist and "visibility based asset

management" (Holmström et al. 2010) that has supplier participating in resource planning of multiple customers. Another example of successful collaboration is joint creation of value propositions (Sjödin et al. 2020) that was found to be useful especially in outcome-oriented contracts. It seems that the case company is yet to achieve such level of interaction to enable true value co-creation (Grönroos 2011).

To create deeper collaboration the case company should consider whether it prefers closed or open business model. Sharing information, increasing visibility and getting different actors from the value chain together to develop solutions could accelerate collaboration (Leminen et al. 2018). However, it is possible that industrial customers are reluctant to give access to their systems and data making it challenging to have a more open ecosystem. Yet there were positive signals as one customer mentioned that they would be open of the case company offering improvements to their processes.

If opening the ecosystem is seen as a threat to sales of own products and services, then the focus could be shifted to internal collaboration. The case company has wide offering but it was reported by the case company respondents that silo behaviour exists and that different business units develop their services largely separately. Mentioned practises of external collaboration could work with internal actors as well. The importance of internal connections and understanding the case company portfolio for providing advanced services were also mentioned by the case company people.

In addition to pursuing revolutionary changes in collaboration, it is also recommendable to keep focusing on the basics. The customers reported cases of insufficient communication and long resolution times. Taking time and resources to keep customers on track of their cases is seen as a prerequisite for more advanced collaboration.

The fifth block was named as "Customers and their needs". The customers consist mostly of companies operating in process industries. Their most important customer needs were discussed in-depth in chapter 5.1. To recap, increasing asset productivity and reducing maintenance costs were identified as the most important customer needs. In addition, improving safety and creating more visibility to operations with predictability came up many times in the data. The customers reported that they do not have sufficient resources or expertise for all of their maintenance operations. Especially expertise of the products and capabilities for analysing the collected data and creating insights from it were reasons why access to case company expertise was considered important.

The sixth block, forming the base of the framework, was named as "Captured value of the service provider". Services should be scaled cost efficiently to enable sufficient cost structure and profitability. It was highlighted that the cost of offering services was still relatively high, especially regarding the foundation of the system to start monitoring. The number of customers having a remote monitoring service was also not yet very high leading to a situation where constant active monitoring is not yet economically viable. Furthermore, as value added by services grows, the need for customisation increases. The findings from chapter 4.2.1 confirm the findings of Vaittinen and Martinsuo (2019) that customers from different industries with different levels of readiness to adopt RM

services should be approached differently. Those varying needs must be answered with efficient mass customisation (Rönnberg Sjödin et al. 2016). Experiences from the marine industry showed that achieving enough scale is difficult and likely to require individual contracts and the RM services as a whole being unprofitable for some time. It was still seen as a requirement of being able to provide sufficient service level with constant monitoring even outside typical office hours. Pursuing economies of scale and scope is seen desirable in literature as well (Visnjic et al. 2017) and achieving it should be a goal especially for large actors such as the case company.

However, aiming for a sustainable cost structure should not necessarily mean that the case company should try to grow by selling the services significantly cheaper than their value. Even though customers were mentioned to be very much focused on costs, aiming to shift the focus to value could be beneficial to the case company. Selling outcomes would allow the case company to get more value from complementary products, accelerate innovation and collaboration, increase customer commitment, manage risks and achieve economies of scope (Visnjic et al. 2017). Experiments could start with only small part of the price being dependent on outcomes. Based on reports from both internal and customer respondents, flexible part of price should be a possible penalty to service provider. Customer would pay the full amount upfront and the service provider would return some of it if outcome is not as agreed. Other applications such as bonuses for great outcomes could be piloted after that.

The case company should also aim to capture non-monetary forms of value from remote monitoring services. As mentioned in the literature, collected data can be sold to customers for benchmarking purposes or used for training the customers to operate their assets more efficiently (Momeni and Martinsuo 2018). Using data for training received tentative acceptance from customer side too as long as data is anonymous and related to case company equipment. Brand benefits are possible as well. Offering state-of-the-art services can be used to improve public image (Löfberg and Åkesson 2018). Increased proportion of remote work and decreased need for travelling can in turn be communicated as ecological progressiveness.

6. CONCLUSIONS

6.1 Academic contribution

The research objectives of this thesis were to clarify the customer needs of remote monitoring services for industrial maintenance and to offer business model improvements so that those needs could be best met.

This thesis confirms the findings of customer value being mostly tied to operational efficiency of customers' production (Grubic 2018; Jonsson et al. 2008; Löfberg and Åkesson 2018). This study adds to previous results, that many customers seem to rather focus on cost reductions than to invest in something that would create new kind of value in their production. Moreover, the idea of risk management through addition of RM services was less familiar to customers than literature would suggest (Grubic 2018). This study also provides a new point-of-view by offering thoughts of people from both the supplier and the customer companies and thus participates in addressing the research gap identified in chapter 2.5.1. Customer sources have been rare in the literature and allow a more direct access to customers' needs than data and experiences from the service providers.

Previous observations regarding essential elements of RM service business model such as new requirements to sales of services (Hasselblatt et al. 2018) and increased emphasis on collaboration (Löfberg and Åkesson 2018) were confirmed. Value propositions were found to be a critical success factor in advanced services (Dijkman et al. 2015). The thesis also searched for understanding of new earning logics to RM services. Different earning logics have been identified and some examples were found from the literature (Visnjic et al. 2017). However, it was revealed that only few companies are ready for methods such as outcome-oriented pricing and that there are still questions related to e.g. managing the risks of outcome-related contracts and defining the achieved benefits. By combining earlier findings and the results of this study, more comprehensive picture of RM service business models has been formed.

This thesis contributes to the remote monitoring services literature by presenting and analysing a case of a RM service provider. The thesis adds to the findings of previous studies on customer needs of RM services for industrial maintenance (Jonsson et al. 2008; Grubic 2014; Grubic 2018) and continues to model business model success factors for RM services.

Based on earlier results (Osterwalder et al. 2010; Ojasalo and Ojasalo 2018; Hakanen and Murtonen 2015) and understanding from remote monitoring services, this study offered a conceptual business model framework for understanding necessary business model components for the special case of remote monitoring services. This framework can be used by both scholars and managers in modelling a company's current or desired business model for RM services.

6.2 Managerial contribution

It was found that the customers' most important needs are achieving high performance of their assets with low costs. Predictability enabled by remote monitoring was seen as a way to achieve these benefits as it can be used to gain information on how the maintenance resources should be allocated. Other customer needs included getting access to supplier's expertise in order to get insights from the collected data. Remote monitoring was also discovered to make it possible to decrease the amount of on-site maintenance leading to potential benefits for supplier in safety, decreased costs and decreased emissions from travelling.

All of the benefits mentioned above were subordinate to customers' needs of getting maximised value for money. Customers were found to be very cost aware and quite price sensitive. However, there were indications of willingness to pilot new solutions as that had already happened with the case company's RM services.

Outcome-oriented pricing could be a way to overcome the customers' great emphasis on low prices as the prices would reflect the achieved benefits. It was found to be an interesting option for RM services, but the experiences from it were very limited. To adopt outcome-oriented pricing, companies should be familiar with their own capability of value creation before offering outcome-oriented pricing. They should also be able to define the achieved benefits accurately. Also understanding customers' processes and the risks related to them is required, as assuming customers' risks is an important feature of outcome-oriented business model.

Elements of building a successful RM service business model were discussed in chapter 5.2. In this chapter, improvements are proposed based on those results. Proposed improvements cover various business processes related to offering RM services. Executing the improvements is likely to require a lot of work and time but the improvements are seen as beneficial to the case company's RM service business. The proposed improvements listed in a table below are mostly in order of the business model framework proposed earlier. The suggestions feature estimates of relative priority (1 to 5, 5 being the highest priority), and the department responsible for carrying out the improvement.

Table 11. *Suggested improvements*

	Suggestion	Priority	Responsibility
1.	Ensure salespeople are familiar with value creation in (RM) services, have positive attitude towards services and courage to propose them	5	Sales management
2.	Invest in data-analysis capabilities to create valuable insights from data with advanced analytics (e.g. artificial intelligence and machine learning)	4	IT, R&D, product management
3.	Identify capabilities of organisation and fulfil gaps through education, recruitment or external partners	4	Upper management
4.	Study critical parts and bottlenecks of customers' processes and target value propositions to them	5	Sales, service
5.	Gather records of financial benefit to customer of existing contracts to create calculations of value and enable tempting value propositions and outcome-oriented pricing	3	Sales
6.	Experiment with new methods (e.g. trial periods) to accelerate customer acquisition in order to achieve scale benefits	1	Sales
7.	Pursue deeper collaboration by creating service value propositions together with customers and increasing information sharing to e.g. maintenance plans, asset use and business planning	3	Sales, Service management
8.	Further leverage the wide offering of the case company by combining products, expertise and best practises from different business units	2	Management

Some of the responsibilities are easier to determine than others, e.g. development of salespeople capabilities is a responsibility of sales management. The fact that RM services of the case company are offered collaboratively combining offering from different businesses increases the need for participation of multiple departments. Increasing internal collaboration is a joint task of entire case company.

Some of the proposed improvements are quicker to achieve, e.g. offering trial periods can be piloted quickly. Yet the results can be seen only after pilot has existed for quite some time. Improving organisational capabilities, on the other hand, is likely require long time and needs to be monitored and iterated constantly. The processes to achieve benefits can be long, but they can be begun instantly. For the most part, improvements can be carried out simultaneously, even though e.g. data-analysis capabilities and knowledge of the customers' processes may need to be improved before creating more reliable calculations of delivered value in complex settings.

Looking at priorities, it is important to remember that the values are subjective and relative. In other words, all the suggestions are considered important and the values represent hierarchy among suggested actions. In addition to more ambitious goals, it is also

necessary to remember the basics such as having sufficient resources and proper communication to customers as those were among the matters that were seen to have room for improvement.

6.3 Limitations of the study

There are some limitations to this study. As this is a single case study, the results should not be generalised for other cases without consideration. This study was conducted as an exploratory research. Typically for explorative studies, the results do not provide a general theory but observations that contribute to increasing information of the subject. Some of the concepts in this thesis, e.g. business model, are rather broad and case specific. It is therefore difficult to offer absolute and generalisable results. Yet the results can be assumed valid, but they should not be applied to fit all possible cases in other industries or functions.

As the data consists of interviews, some statements may be subjective. The interviews were transcribed and translated from Finnish to English, possibly leading to misunderstandings. All of the interviews followed a question frame for either customers or internal respondents. This ensured that each interview included all the main themes of this thesis. Some of the questions were of predictive nature, there is no certainty of how the RM service market will evolve or which capabilities will be the most important in future. However, from a group of statements some conclusion can be drawn. It is also possible that some respondents were not familiar with the concepts of e.g. business model or value co-creation even though those concepts were explained during the interviews. Possible misunderstandings could have led to invalid statements from the respondents. There were a total eight respondents in primary data and 11 in secondary data. The sample size of respondents is therefore limited but it is seen to provide sufficient reliability.

In addition to primary data, secondary data was used in this thesis. Using two sources of data, having both internal respondents and customers from multiple companies are ways to improve reliability of the data. Moreover, internal respondents were selected from different units and functions to offer multiple viewpoints.

6.4 Future research

As mentioned, in limitations, more studies like this are needed to confirm the findings of this thesis. In addition to confirming the findings presented in this study, some other potential avenues for future research can be identified.

Remote monitoring can open possibilities for creating new, innovative value propositions (Grubic 2014). This study revealed that innovative value propositions are still scarce in the literature. Same lack of findings applies to outcome-oriented earning in industrial remote monitoring services. The lack of cases in literature can be at least partially explained by difficulties in turning data into insights of new service possibilities, measuring delivered results especially in environment of multiple actors, and managing risks related

to outcome-oriented pricing. More research on cases where companies have successfully executed innovative value propositions and implemented outcome-oriented pricing in complex industrial entities is needed to understand how RM services can be used to create, deliver and capture large amounts of value.

The respondents of this study did not associate safety directly to remote monitoring services, even though that thought has been presented in the literature (Grubic 2018). Results on how significant safety improvements can be achieved by using RM services would be an interesting subject.

Value co-creation was found to be a topic more familiar among scholars than managers. The experiences from collaboration were not as advanced as some examples in literature (Holmström et al. 2010; Porter and Heppelmann 2014). Also, the idea of supplier as value creator was evident in the empirical part, contrary to literature (Heinonen et al. 2010; Grönroos 2011). More examples of collaborative business models and the results created by value co-creation are needed.

Even though this study is one of the few in this field to include data directly from the customers, a large part of the data is still from internal sources. Considering the lack of customers' voices in most studies, more research featuring the perspective of the customers is still required to get more customer-oriented picture of remote monitoring services. Especially customers' readiness for new ways of doing business such as deeper collaboration and shift from product-oriented services to usage- or outcome-oriented services would be interesting.

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APPENDIX A: QUESTION FRAME FOR CUSTOMER RESPONDENTS

INTRODUCTION

- Could you introduce your background and describe your job?
- How long have you been in this role/company?

SERVICES AND REMOTE MONITORING

- Do you see the case company primarily as a service provider or equipment manufacturer?
- What kind experiences do you have on remote services?
- Do you have experiences on the case company's remote services?
- What are the main benefits of RM services for your company?
- What are the main challenges related to RM services?
- For what reasons has your company decided to buy/not buy RM services?

- Is the maintenance strategy of your company mostly reactive, preventive or predictive?
- What are the main goals in your maintenance? In what timeframe?
- How long of a predictability do you consider valuable?
- Does service provided by the case company enable predictive maintenance?

- Do you see any issues in data sharing and ownership?
- What do you think on who should own the data?
- What ways of communication do you prefer in a service relationship?
- What is the willingness of your company to adopt new technologies?
- What is the readiness to deeper collaboration with the service provider?
    - Would you e.g. trust to let another company advise in process improvements or manage equipment maintenance plan?

CUSTOMER VALUE AND COLLABORATION

- Has the case company been successful in its value proposition?
- How do the case company's offered benefits match the most important needs?
- Has customer value been quantified for any of the case company's products or services?
- What are main benefits provided by the case company's service?
    - How do they differ from competitors?
- What are main costs related to buying the case company's service?
    - How do they differ from competitors?

- Was the customer value on par with what was promised?
- What are the main points of improvement of the case company's services?
- Would you consider the case company as a customer-oriented company?

- Where do you think most value is created in service relationship?

- What kind of collaboration experiences do you have with the case company regarding services?

BUSINESS MODEL

- How do you think the RM services should be priced?

A FREE WORD

- Do you have any other comments or feedback about the interview?

APPENDIX B: QUESTION FRAME FOR INTERNAL RESPONDENTS

INTRODUCTION

- Could you introduce your background and describe your job?
- How long have you been in this role/company?

SERVICES AND REMOTE MONITORING IN GENERAL

- How would you describe the role of services in the case company?
- Is the case company more of a manufacturer or service provider?
- Do you see any conflict between being a manufacturer and a service provider?
- What kind of RM services are being offered by the case company?
- What is the importance of RM for the case company and your department in it?
- What kind of experiences do you have on RM services?

- What is the level of competition in this field?
- Do you know if the competition is against other companies offering similar services or customer selecting other types of options?
- What is the case company´s position in competition?
- What are the differentiating factors?
- How would you see the market for RM services develop in the future?

CUSTOMERS, CUSTOMER VALUE AND CUSTOMER NEEDS

- What is the typical customer profile?
- Is there a lot of variation between customers?
- What are main benefits **for customer** provided by the case company's service?
    - How do they differ from competitors?
- What are main costs **for customer** provided by the case company's service?
    - How do they differ from competitors?
- What are the benefits and cost for the case company for providing RM services?
    - How thoroughly has the matter been investigated in the case company?
- Has customer value been quantified for any the case company products or services?
- What kind of research has been made on customer needs? By whom?
- Do different customers have different needs?
    - If so, are services tailored/flexible to match the need?
    - How is the flexibility made possible?

SELLING AND PROVIDING RM SERVICES, VALUE CREATION

- For what reasons have customers decided to buy/ not buy RM services?
- What are the main challenges in sales and delivery of RM services?
- Who owns the data collected by the case company?
    - Are there disagreements on who should own it?
- How is the communication between the case company and customer managed when in service relationship?
- Have the customers been satisfied with the RM services?

- Where do you think most value is created in service relationship?
- Have you participated in collaboration with customer regarding services?
    - What kind of collaboration has it been?
- What is the customer readiness to deeper collaboration with the service provider?
- What is the readiness to adopt new technologies inside the case company?

BUSINESS MODEL

- What is the business model of the case company for RM services?
    - Why is it such? How did it turn out to be like that?
- What are the strengths and weaknesses of the current business model?
- Are there business models on the market that differ significantly from the case company´s?
- Which skills or capabilities are especially important in RM services?
- How are the RM services priced currently?
- Have other pricing methods being considered?

A FREE WORD

- Do you have any other comments or feedback about the interview?